# A
# Major Project Report

**On**

## "Touch Robot: An Artificial Intelligence-Enabled Machine For Human Behavior Detection"

Submitted in partial fulfillment of the

Requirements for the award of the degree of

**Bachelor of Technology**

**In**

**Computer Science & Engineering –**

**Artificial Intelligence & Machine Learning**

**By**


| | |
|---|---|
| B. Roopesh | – 20R21A6605 |
| T. Laxmi Prasanna | – 20R21A6650 |
| T. Ashwitha Reddy | – 20R21A6651 |
| Yellu Siri | – 20R21A6660 |

Under the guidance of

**Mr. J Vijay Gopal**

**Associate Professor**

**Department of Computer Science & Engineering –**

**Artificial Intelligence & Machine Learning**

MARRI LAXMAN REDDY GROUP OF INSTITUTIONS

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Affiliated to JNTUH, Approved by AICTE

Laxman Reddy Avenue, Dundigal, Hyderabad-500 043, Telangana, India

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**2024**

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Laxman Reddy Avenue, Dundigal, Hyderabad-500 043, Telangana, India

## Department of Computer Science & Engineering-
## Artificial Intelligence & Machine Learning

# CERTIFICATE

This is to certify that the project entitled **"Touch Robot: An Artificial Intelligence-Enabled Machine For Human Behavior Detection"** has been submitted by **B. Roopesh (20R21A6605), T. Laxmi Prasanna (20R21A6650), T. Ashwitha Reddy (20R21A6651), Yellu Siri (20R21A6660)** in partial fulfilment of the requirements for the award of degree of Bachelor of Technology in Computer Science and Engineering from Jawaharlal Nehru Technological University, Hyderabad. The results embodied in this project have not been submitted to any other University or Institution for the award of any degree or diploma.

**Internal Guide** **Head of the Department**

**Project coordinator** **External Examiner**

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Laxman Reddy Avenue, Dundigal, Hyderabad-500 043, Telangana, India

# Department of Computer Science & Engineering- Artificial Intelligence & Machine Learning

## DECLARATION

We hereby declare that the project entitled **"Touch Robot: An Artificial Intelligence-Enabled Machine For Human Behavior Detection"** is the work done during the period from **January 2024 to May 2024** and is submitted in partial fulfilment of the requirements for the award of degree of Bachelor of Technology in Computer Science and Engineering from Jawaharlal Nehru Technology University, Hyderabad. The results embodied in this project have not been submitted to any other university or Institution for the award of any degree or diploma.

**B. Roopesh** – **20R21A6605**
**T. Laxmi Prasanna** – **20R21A6650**
**T. Ashwitha Reddy** – **20R21A6651**
**Yellu Siri** – **20R21A6660**

# Department of Computer Science & Engineering-Artificial Intelligence & Machine Learning

## ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people who made it possible, whose constant guidance and encouragement crowned our efforts with success. It is a pleasant aspect that we now have the opportunity to express our guidance for all of them.

First of all, we would like to express our deep gratitude towards our internal guide **Mr. J VIJAY GOPAL,** Assistant Professor, Department of CSE -AIML for his support in the completion of our dissertation. We wish to express our sincere thanks to **Dr. K. SAI PRASAD,** HOD, Dept. of CSE-AIML and principal **Dr. K. SRINIVAS RAO** for providing the facilities to complete the dissertation.

We would like to thank all our faculty and friends for their help and constructive criticism during the project period. Finally, we are very much indebted to our parents for their moral support and encouragement to achieve goals.

**B. Roopesh** – **20R21A6605**
**T. Laxmi Prasanna** – **20R21A6650**
**T. Ashwitha Reddy** – **20R21A6651**
**Yellu Siri** – **20R21A6660**

# Department of Computer Science & Engineering-Artificial Intelligence & Machine Learning

## ABSTRACT

In the world today, child maltreatment and violence against children have become a common shocking reality that is frequently discussed in various media platforms. When it comes to child safety and learning appropriate physical boundaries, such things are vital aspects of a growing kid. Unluckily, media outlets often report incidences where children are defiled sexually either by trusted adults or strangers. This problem is widely spread in India and there are many cases within the family as well as outside family members committing incestuous acts. One out of every nine girls and one out of fifty-three boys will be victims of sexual abuse before they reach eighteen years at which time their innocence is tampered with by at least 90% of the culprits. It means only 10% of these abusers are unknown to the victim-parents need not worry so much about strangers harming their kids, but they should be vigilant enough to ensure that their own friends and relatives do not molest them. To address this matter effectively, fresh approaches like facial recognition, and voice identification together with hi-tech artificial brains that can learn from experience have been proposed. These robots have been equipped with tactile transducers measuring touch pressure making them act as friendly companions for students who therefore get age-specific situations that make them aware while learning bad touch from good ones.

# APPENDIX-1

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# LIST OF TABLES

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# LIST OF ABBREVIATIONS

# ABBREVIATIONS

| | |
|---|---|
| **HOG** | **Histogram of Oriented Gradients** |
| **SVM** | **Support Vector Machine** |

# APPENDIX-4

# REFRENCES

## References

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# INDEX

# CHAPTER 1

# INTRODUCTION

## 1.1 OVERVIEW

In the current world, it is very important that the society finds appropriate mechanisms for training children on personal boundaries and safety in order to secure their lives. One creative solution to this issue would be to include technology in educational programs meant for kids. Thus we can create flexible learning opportunities for children that not only educate them but also empower them with confidence for handling concerns related to interpersonal relationships and security. By leveraging interactive tools and involving platforms, we can produce dynamic teaching experiences that not only instruct but also give young individuals the wherewithal to maneuver through the intricacies involved in human interaction and personal safety. Through technological inclusion, children can be exposed to many situations and places in a harmless environment. Such devices can replicate real-life exchanges where children can practice recognizing safe areas and reacting to personal borders. These gadgets work by incorporating sensors alongside pre-programmed responses so as to provide instant feedback and directions thus facilitating comprehension of acceptable conduct or communication among young people.

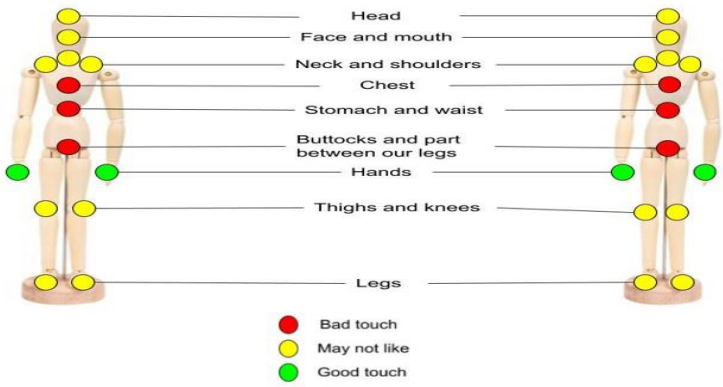



Figure 1.: Areas of Good Touch and Bad Touch

This strategy is strongly focused on empowerment and agency. The idea is not merely to teach, but to develop self-confidence and give children tools that enable them to stand up for themselves and ask for help when they need it. We can make children aware of times when their safety might be compromised by promoting transparent communication with them and instilling in them any doubt about themselves. Moreover, we can improve understanding and appreciation

of the most important topics if dynamic learning spaces are created around them for children to understand.Children may learn personal security through engaging in games, dialogue, story-telling. It is therefore possible to reinforce the value of multimedia and interactive experiences in these types of educational endeavors as a way of creating meaningful opportunities for learning. Ultimately, this goal aims at providing children with the knowledge, skills, and confidence that will enable them travel safely through life. It signifies that technology has been introduced into education programs centered on personal safety so as to equip young individuals with skills, knowledge, and self-esteem necessary for facing life challenges.

## 1.2 PURPOSE OF THE PROJECT

The purpose of the Touch Robot project is to create an intelligent machine designed to analyze human behavior, focusing on teaching children the concepts of good and bad touch. By integrating facial recognition technology, the system can identify children and initiate specific learning programs to promote understanding and awareness of appropriate touch behavior. If facial recognition fails, the system dynamically creates personal information and stores the parent's contact information. The robot is equipped with touch and pressure sensors that can distinguish various touch situations and alert parents via the Twilio interface when there is a potential danger. Through interactive activities and up-to-date feedback, the program focuses on creating a more knowledgeable and safer environment by focusing on children's knowledge and skills to interact safely with touch.

## 1.3 MOTIVATION

The motivation behind the touch robot project is to address important issues of child safety, specifically teaching children the concepts of good and bad. By integrating artificial intelligence and robotics, the project aims to create an interactive and engaging environment for students to learn and understand these important concepts. Using facial recognition technology, robots can provide personalized education to each child and deliver appropriate educational content. Additionally, the integration of touch sensors allows the robot to distinguish between various touch states, providing immediate feedback and alerts to parents when an intervention occurs. Finally, the program strives to create a safer, more informed environment for children by giving them the knowledge and skills they need to recognize and respond appropriately to different interactions.

# CHAPTER 2

# LITERATURE SURVEY

An extensive literature survey has been conducted by studying existing systems of Certificate verification and generation. A good number of research papers, journals, and publications have also been referred before formulating this survey.

## 2.1 EXISTING SYSTEM

| 1 | | |
|---|---|---|
| **Reference in APA format** | W. Bradley Knox, Peter Stone, Cynthia Breazeal Bartneck, & Maddy D. Janse, "Training a Robot via Human Feedback", October 2013 DOI:10.1007/978-3-319-02675-6_46 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://link.springer.com/chapter/10.1007/978-3-319-02675-6_46 | W. Bradley Knox , Peter Stone and Cynthia Breazeal | TAMER, Physically embodied robot,Multiple behaviors, Feedback |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Training a Robot via Human Feedback | Aim is to apply a framework for learning from human feedback to a physically embodied robot. | Author used human feedback in multiple forms for training a physical robot in which it determines the Good touch and Bad touch. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Data collection and feedback encoding. | Enabling the acquisition of diverse and complex behaviors without the need for explicit programming opens up new possibilities for robots, allowing them to adapt to changing environments and tasks. This, in turn, facilitates the integration of robots into real-world scenarios. | The process of training a robot through human feedback has its limitations. There is a possibility of the feedback being noisy, inconsistent, or incomplete, which can hinder effective learning. Moreover, it may require a considerable amount of human involvement and time to train a robot through feedback |
| **2** | Learning algorithm such as TAMER, Iterative Process | | |
| **3** | Evaluation , Adjustment and Finetuning | | |
| **4** | Deployment | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Effectiveness of the robot's learning and improvement. | Nature and quality of human feedback | Algorithm or learning model used by the robot. | Adjustments made by the robot in |

| | | | |
|---|---|---|---|
| | provided to the robot. | | response to human feedback. |

**Relationship Among The Above 4 Variables in This article**

The quality of human feedback provided (independent variable) influences the effectiveness of the robot's learning and improvement (dependent variable). This influence might be moderated by the robot's learning algorithm or model (moderating variable), while the adjustments made by the robot in response to the feedback serve as a mediator, showcasing how the feedback impacts the robot's behavior or skills during the learning process..

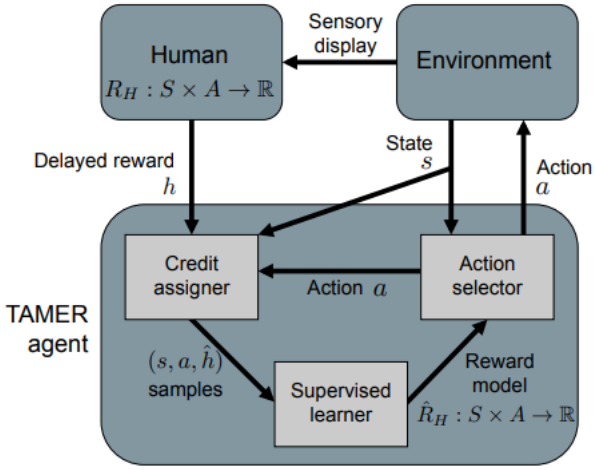
| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / Human Feedback<br>**Output** / Robot learning | Developing a robot by learning multiple feedbacks from users can help in detecting good touch and bad touch. | Good to have this knowledge from this paper as we review all the basic algorithms under TAMER. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| The process of learning can be made more intuitive for humans because they can communicate their preferences or corrections directly. This makes it accessible for users who may not have technical expertise. | Since this is a performance evaluation of various algorithms, not much to project on negative side as all the things used are defined in advance. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| This work is good, as they tried developing a robot with human feedback which evaluates good touch and bad touch. | TAMER. | Abstract<br>I. Introduction<br>II. Background on TAMER<br>III. The MDS Robot Nexi |

| | | |
|---|---|---|
| | | IV. TAMER Algorithm for Interactive Robot Navigation<br>V. Results and Discussion<br>VI. Conclusion Future work |

**Diagram/Flowchart**




An Information Flow Diagram Illustrating the TAMER Framework

**--End of Paper 1—**

**2**

| | | |
|---|---|---|
| **Reference in APA format** | Saerbeck M., Schut T., Bartneck C., & Janse M. D. (2010). "Expressive robots in education", Proceedings of the 28th International Conference on Human Factors in Computing Systems - CHI '10. doi:10.1145/1753326.1753567 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |

| | | |
|---|---|---|
| https://sci-hub.se/https:/dl.acm.org/doi/abs/10.1145/1753326.1753567 | Martin Saerbeck, Tom Schut, Christoph Bartneck, Maddy D. Janse | Social interaction, Education, Tutoring, Human-robot interaction |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Expressive Robots in Education Varying the Degree of Social Supportive Behavior of a Robotic Tutor | It emphasizes the importance of social interaction in education so as to improve learning experiences, through realistic communication by means of sounds, gestures and emotions, which can be achieved via virtual agents, particularly humanoid robots. | Tutoring a application with the robotic research platform “interactive Cat” to develop social interaction to improve learning experiences. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

This process aims to develop social support behavior for robotics tutors in a language learning application, using the "interactive Cat" research platform. To achieve effective educational results, it is important to develop mechanisms for changing the level of social interaction.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Development of Social Supportive Behaviors | The use of robots, capable of providing a sensitive and effective teaching tool | To give the concept of good and bad touch an effective meaning, as |

| | | | |
|---|---|---|---|
| | | to help children learn about personal boundaries and safety, could enhance their understanding of good touch and bad touch. | well as ensuring that robots' behavior is age appropriate and sensitive to cultural differences, it is necessary to accurately calibrate robot expressions. |
| **2** | Integration of Awareness of Good and Bad Touch | | |
| **3** | Utilization of "Interactive Cat" Platform | | |
| **4** | Iterative Development Process | | |

**Major Impact Factors in this Work**

| **Dependent Variable** | **Independent Variable** | **Moderating variable** | **Mediating (Intervening ) variable** |
|---|---|---|---|
| Educational outcomes or performance of the students. | Degree of social supportive behavior exhibited by the robotic tutor, manipulated to observe its impact on learning. | Students' initial proficiency or comfort level with the language, influencing how they respond to the robot's social behaviors. | Students' engagement levels, mediating the relationship between the robot's social support and the ultimate educational outcomes. |

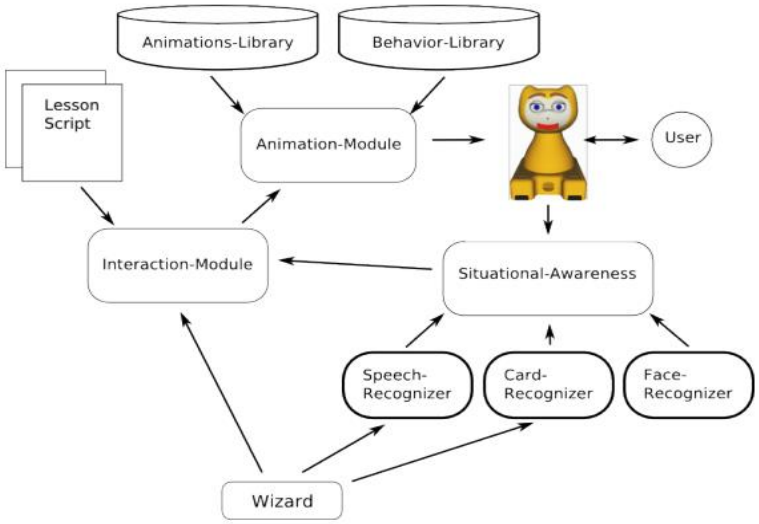
**Relationship Among The Above 4 Variables in This article**

The study investigates how changing the social support behavior of the robotic tutor affects language learning outcomes, taking students' proficiency as a moderating factor and their engagement as a mediating factor into account.

<table>
<tr><th>Input and Output</th><th>Feature of This Solution</th><th>Contribution in This Work</th></tr>
<tr><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>Interactions with the robotic tutor through the "interactive Cat" research platform</td><td>Responses and behaviors generated by the robot</td></tr></table></td><td>It deals with the development of social supportive behavior for robotic tutors in a language learning application. It's using a robotic research platform called the "interactive cat" to help people understand good and bad touch.</td><td>In order to improve language learning experiences on educational applications, it aims at increasing the social support of a robot tutor through an "interactive cat" research platform.</td></tr>
<tr><th colspan="2">Positive Impact of this Solution in This Project Domain</th><th>Negative Impact of this Solution in This Project Domain</th></tr>
<tr><td colspan="2">In an educational environment, the use of robotic tutors with social support behaviors is aimed at teaching students how to recognize good and bad touch. In order to provide effective language learning support, the study has been equipped with a dynamic Cat platform.</td><td>Expressive robot as a tutor for teaching awareness of good touch and bad touch. Specific focus will be placed on building social support behaviour for robotic tutors in a language learning application.</td></tr>
<tr><th>Analyse This Work By Critical Thinking</th><th>The Tools That Assessed this Work</th><th>What is the Structure of this Paper</th></tr>
<tr><td>It underlines the importance of involving expressive robots in education so as to enable effective learning experiences, especially with regard to knowledge about good touch and bad touch, which may be a critical aspect</td><td>"Interactive Cat" robotic research platform</td><td>Abstract<br>I. Introduction<br>II. Tutoring Application Design<br>III. Evaluation Of The Robot Tutor</td></tr>
</table>

| | | |
|---|---|---|
| for educational environments where physical interaction with robots takes place. | | Application<br>IV. Results<br>V. Discussion<br>VI. Conclusion |

**Diagram/Flowchart**




Architecture of the Tutoring Application.

**--End of Paper 2—**

**3**

| **Reference in APA format** | Sandra Costa, Hagen Lehmann, & Kerstin, "Using a Humanoid Robot to Elicit Body Awareness and Appropriate Physical Interaction in Children with Autis", April 2014 International Journal of Social Robotics 7(2):1-14 DOI:10.1007/s12369-014-0250-2 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://link.springer.com/article/10.1007/s12369-014-0250-2 | Sandra Costa, Hagen Lehmann, Kerstin Dautenhahn, Ben Robins, Filomena Soares | Assistive technologies, Body awareness , Human–robot interaction , Socially assistive robots |

| The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc ) | The Goal (Objective) of this Solution & What is the problem that need to be solved | What are the components of it? |
|---|---|---|
| Using a Humanoid Robot to Elicit Body Awareness and Appropriate Physical Interaction in Children with Autis | Enhance body awareness in autistic children through humanoid robot interaction. | Touch sensors, Humanoid Robot(KASPAR) |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Introduction and Research objective, Robot preparation | The study successfully promoted a triadic relationship between the child, the robot, and the experimenter, helping children identify body parts and encouraging gentle touches. | Data collection and analysis can be complex, and the study highlights the challenges involved in interpreting the data. |
| **2** | Experiment Design, Participant Selection | | |
| **3** | Data Collection, Data Analysis | | |
| **4** | Findings and Conclusion | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Improvement in body awareness and appropriate physical interaction in children with autism. | Design and functionality of the humanoid robot for interaction. | Individual traits or sensory profiles of children with autism. | Engagement level and response patterns during interaction. |

**Relationship Among The Above 4 Variables in This article**

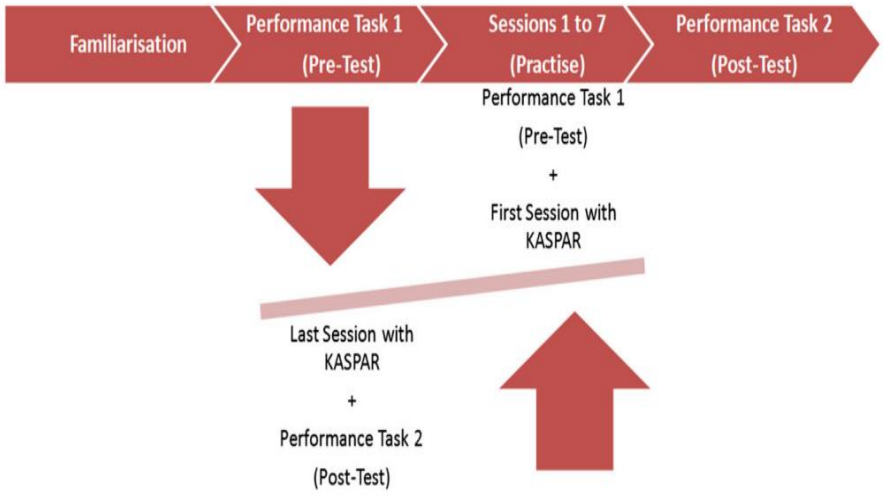
The design and functionality of the humanoid robot (independent variable) influence the improvement in body awareness and appropriate physical interaction among children with autism (dependent variable). This influence may be moderated by individual traits or sensory profiles (moderating variable), while the engagement level and response patterns during interaction serve as a mediator, showcasing how the interaction with the robot impacts the children's body awareness and interaction skills.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input**: Human Robot Interaction<br>**Output**: Teaching Autism | Can be derivable to other domains as well | To the extent this work is designed for the Education institutions for detecting good touch and bad touch. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| This innovative approach offers a promising avenue for therapeutic interventions in autism. | The study doesn't address long-term effects or limitations of using humanoid robots for therapy. Ethical considerations need to be carefully considered for robot-assisted interventions in child development. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| Since this designed for educational institutions, the scope of using this in real time can be very limited. This can be used to teach children to get awareness about good touch and bad touch. | Humanoid Robot. | Abstract<br>I. Introduction<br>II. Background<br>III. Methods<br>IV. Discussion<br>V. Conclusion and Future work |

**Diagram/Flowchart**




Four Different Phases of Study

**--End of Paper 3—**

| 4 | |
|---|---|
| **Reference in APA format** | T. Kanda, H. Ishiguro, T. Ono, M. Imai, & R. Nakatsu, "Development and evaluation of an interactive humanoid robot "Robovie" - An interdisciplinary approach", Conference: Robotics Research, The Tenth International Symposium, ISRR 2001, Lorne, Victoria, Australia, November 9-12 2001, DOI:10.1007/3-540-36460-9_12 |

| URL of the Reference | Authors Names and Emails | Keywords in this Reference |
|---|---|---|
| https://ieeexplore.ieee.org/abstract/document/1014810 | T. Kanda, H. Ishiguro, T. Ono, M. Imai, R. Nakatsu | Mobile robots , interactive systems , cognitive systems , intelligent control , software architecture |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Development and evaluation of an interactive humanoid robot "Robovie" | The aim is to create a robot that can establish communicative relationships with humans through natural and effective human-robot communication. | Arms, Head, Eyes, Mobile Platform, Sensors, Battery |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| 1 | Evaluation of Robot Performance: The document describes an experiment conducted to evaluate the performance of a humanoid robot in interacting with humans. Three behavior patterns were compared: Passive, Active, and Complex. | Evaluation of Robot Performance: The document describes an experiment conducted to evaluate the performance of a humanoid robot in interacting with humans. Three behavior patterns were compared: Passive, Active, and Complex. | Ensuring the safety of both the robot and its human users is critical. Humanoid robots need robust safety features |

| | | | |
|---|---|---|---|
| **2** | Methodology: The experiment involved 31 university students as subjects. Each subject observed one of the behavior patterns for five minutes. The impressions of the robot were evaluated using a questionnaire with 28 adjective pairs. The subjects' behaviors towards the robot were also analyzed. | The architecture incorporates psychological measures for interaction-oriented robots, which helps improve their performance. | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Assess the clarity and effectiveness of communication between the robot and users. | Experiment with different speech synthesis and recognition technologies. | The age of users may moderate the effectiveness of the robot, as preferences and expectations can vary across age groups. | User satisfaction with the interactions may mediate the relationship between the robot's features and positive outcomes. |

**Relationship Among The Above 4 Variables in This article**

The age of users influences how the independent variable (speech synthesis and recognition technologies) affects the dependent variable (communication clarity and effectiveness), and user satisfaction acts as a mediating variable, providing insight into the process through which the robot's features impact positive communication outcomes.

<table>
<tr><th>Input and Output</th><th>Feature of This Solution</th><th>Contribution & The Value of This Work</th></tr>
<tr><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>Touches on the robot</td><td>Analysis of touch behaviors.</td></tr></table></td><td>Describes the development of a software architecture for an interaction-oriented robot. The architecture is based on situated modules and communicative units.</td><td>This work focuses on the development and evaluation of an interactive humanoid robot named "Robovie" that aims to communicate and interact with humans in daily life.</td></tr>
<tr><th colspan="2">Positive Impact of this Solution in This Project Domain</th><th>Negative Impact of this Solution in This Project Domain</th></tr>
<tr><td colspan="2">It allows the robots to autonomously exhibit friendly behaviors and interact with humans.</td><td>The implemented situated modules in the robots have a limited range of behaviors, such as handshakes and simple conversations.</td></tr>
<tr><th>Analyse This Work By Critical Thinking</th><th>The Tools That Assessed this Work</th><th>What is the Structure of this Paper</th></tr>
<tr><td>Effective interactive behaviors and the capacity for bodily expression are important for human-robot contact, as the analysis of the robot's performance for human engagement demonstrates. This experiment gives us information about how people see and react to the actions of the robot. These results help to build interaction-oriented robots that are more efficient and natural-feeling.</td><td></td><td>Abstract<br>I. Introduction<br>II. Software Architecture<br>III. Interactive Behaviors<br>IV. Communicative units<br>V. Experimental Phases<br>VI. Ideas about Body Properties of Robots<br>VII. Conclusion</td></tr>
<tr><td colspan="3"></td></tr>
</table>

| Diagram/Flowchart |
|---|
| |

**--End of Paper 4—**

**5**

| **Reference in APA format** | Kerruish, & Erika Mackie, "Affective touch in social robots", Transformations, Vol.29, pp.116-134 15/09/2021 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://shorturl.at/ouzMV | Kerruish, Erika Mackie | Robots, touch, affect, haptic creature |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Affective touch in social robots | The goal of this solution is to explore the significance of affective touch in human-robot interactions, specifically focusing on the communication of emotions through touch gestures. | The paper mentions a robotic seal called Paro, which has a skin of tactile sensors under its furry coat. |

| **The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process** | | | |
|---|---|---|---|
| | **Process Steps** | **Advantage** | **Disadvantage (Limitation)** |

| | | | |
|---|---|---|---|
| **1** | The infiltration of digital technologies into daily life conditions embodied agency in social robotics. | Social robotics' integration of low-tech and creative processes with quantification reconfigures the intimate relationships of emotive contact in novel ways. | The fact that affective computing in social robots ignores the ambivalence and conflicting emotions present in every emotional experience is a drawback. |
| **2** | Research with robots like Paro and the Haptic Creature involves the incorporation of touch sensors and expressive design. | | |

**Major Impact Factors in this Work**

| **Dependent Variable** | **Independent Variable** | **Moderating variable** | **Mediating (Intervening ) variable** |
|---|---|---|---|
| Users' emotional response or mood after experiencing affective touch from social robots. | Affective touch implemented by social robots, with variations in intensity, duration, or type of touch. | Individual differences in users, such as their personality traits, cultural background, or prior experiences with robots, may moderate the impact of affective touch on emotional responses. | User engagement or perceived social connection with the robot may mediate the relationship between affective touch and users' emotional responses. |

**Relationship Among The Above 4 Variables in This article**

Affective touch in social robots (IV) directly influences users' emotional responses (DV), but the impact may be moderated by individual differences in users (MV), and the process

through which affective touch influences emotions may be mediated by user engagement or perceived social connection (MeV).

<table>
<tr><th>Input and Output</th><th>Feature of This Solution</th><th>Contribution & The Value of This Work</th></tr>
<tr><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>Touch on robot</td><td>Building an interaction between humans and robots.</td></tr></table></td><td>The given document discusses the dynamics of affective touch and the role of touch in human-robot interactions.</td><td>The work covered in the provided document advances knowledge of how the body and art objects interact, especially regarding impact and the experience of novel and varied technology.</td></tr>
<tr><th colspan="2">Positive Impact of this Solution in This Project Domain</th><th>Negative Impact of this Solution in This Project Domain</th></tr>
<tr><td colspan="2">The incorporation of affective touch in social robots can contribute to the development of more inclusive and accessible technologies. By considering the diverse ways in which individuals perceive and express emotions through touch, the robots can accommodate a wider range of users.</td><td>The limitation of quantification in capturing the complexity and multiplicity of touch.</td></tr>
<tr><th>Analyse This Work By Critical Thinking</th><th>The Tools That Assessed this Work</th><th>What is the Structure of this Paper</th></tr>
<tr><td>The examination of the provided piece emphasizes how crucial touch is to the interaction of the body, affect, and art objects. It highlights the significance of touch in the research of tactile interaction in social robots and artwork,</td><td>Touch dictionary</td><td>Abstract<br>I. Introduction<br>II. Literature Review<br>III. Research Methodology<br>IV. Findings and Discussion<br>V. Conclusion<br>VI. References</td></tr>
</table>

| | | |
|---|---|---|
| as well as the embodied experience of virtual reality. | | |
| **Diagram/Flowchart** | | |
| | | |

**--End of Paper 5—**

| **6** | | |
|---|---|---|
| **Reference in APA format** | Midorikawa R., & Niitsuma M. (2018). "Effects of Touch Experience on Active Human Touch in Human-Robot Interaction", IFAC- PapersOnLine, 51(22), 154–159. doi:10.1016/j.ifacol.2018.11.534 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.sciencedirect.com/science/article/pii/S2405896318332403 | Ryo Midorikawa, Mihoko Niitsuma | Human-robot interaction, touch, handshake |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Effects of Touch Experience on Active Human Touch in Human-Robot Interaction | The aim is to build a better relationship between human and robot through touch. | The author discusses effects and feelings associated with the touch of a robot improve human robot interaction . |
| **The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process** | | |

This process is expected to explore the role played by physical contact, e.g. a handshake, in affecting humans' robot relationships which could include factors like sensory feedback, belief building and emotions related to improving interaction outcomes.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Robot Hardware Selection | Users' comfort and confidence can be enhanced by the formation of a relationship between humanoid robots through tangible contact, such as handshakes, which could improve cooperation and collaboration in different types of interaction scenarios involving Humanoid Robots. | To avoid any unpleasantness or misinterpretation, the robot requires careful design and continuous refinement of its tactile feedback and response which is compatible with a wide variety of societal norms and personal preferences. |
| **2** | Design Model for Physical Interaction with a Robot | | |
| **3** | Design of Handshake Interaction | | |
| **4** | Interactive design | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| "Interaction outcomes,"Measurin | "Physical contact," such as a handshake, influencing the | "Sensory feedback," indicating conditions | "Emotions," mediating the relationship by |

| | | | |
|---|---|---|---|
| g the impact of touch experience. | relationship between humans and robots. | under which the impact varies. | influencing beliefs and contributing to the overall effect of touch on human-robot interaction. |

| **Relationship Among The Above 4 Variables in This article** |
|---|
| The study intends to investigate how physical contact influences the dynamics between humans and robots, taking sensory feedback, emotions, and belief formation into account as contributing factors to improve interaction outcomes. |

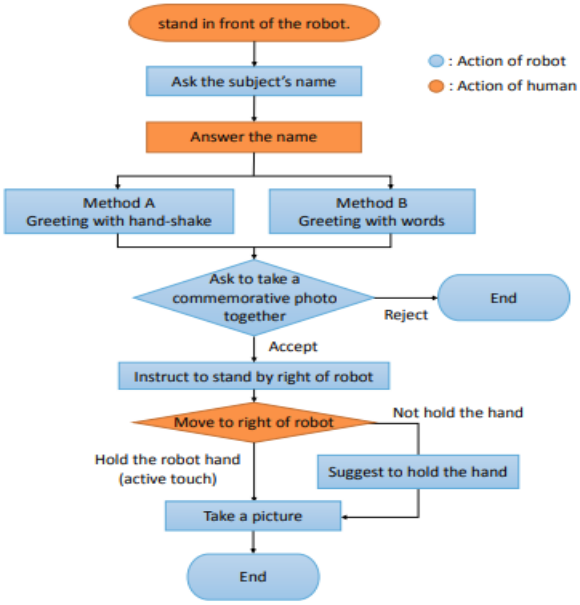
| **Input and Output** | **Feature of This Solution** | **Contribution & The Value of This Work** |
|---|---|---|
| **Input** / **Output**<br>Human-robot physical contact. / Enhanced human-robot relationship through tactile interaction. | By simulating physical interaction, for example handshakes, this solution highlights the importance of strengthening relations between humans and robots. | The work aims to explore how touch experiences enhance human robot interactions, in particular through handshakes which create more natural and meaningful connections between humans and robots. |

| **Positive Impact of this Solution in This Project Domain** | **Negative Impact of this Solution in This Project Domain** |
|---|---|
| To promote awareness of appropriate contact, such as handshakes, to build trust and understanding when it comes to recognition of the right or wrong touch, within these human robot relationships. | Using the robot to train people's awareness of good and bad touch through physical contact, such as a handshake, might desensitize them to what it is like to interact with humans in sensitive contexts. |

| **Analyse This Work By Critical Thinking** | **The Tools That Assessed this Work** | **What is the Structure of this Paper** |
|---|---|---|

| | | |
|---|---|---|
| It examines the potential of robots for teaching, specifically in view of differentiating between good and bad touch through interactions like handshakes to enhance human interaction with robots by focusing on using safety education as an educational tool that promotes awareness of suitable physical contact. | Physical contact. | Abstract<br>I. Introduction<br>II. How to provide a touch experience to a person<br>III. Design of touch by a robot<br>IV. Interaction design<br>V. Experiment<br>VI. Result and discussion<br>VII. Conclusion |

**Diagram/Flowchart**




Flow Chart of the Interaction Process

**---End of Paper 6—**

| 7 | | |
|---|---|---|
| **Reference in APA format** | Drury J. L., Scholtz J., & Yanco H. A., "Awareness in human-robot interactions", SMC'03 Conference Proceedings. 2003 IEEE International Conference on Systems, Man and Cybernetics. Conference Theme - System Security and Assurance (Cat. No.03CH37483). doi:10.1109/icsmc.2003.1243931 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://sci-hub.se/https:/ieeexplore.ieee.org/abstract/document/1243931 | Jill L. Drury, Jean Scholtc, Holly A. Yanco | Awareness, human-robot interaction, critical incident analysis, human-computer interaction. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Awareness in Human-Robot Interactions | To describe the types of awareness that humans have of robot activities and the knowledge that robots have of the commands given them by humans. | Developing a framework for understanding human robot interaction using four different robotic systems. |
| **The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process** | | |
| This process examines the interaction between humans and robots by examining the types of reciprocal awareness that humans have about robot activities and the knowledge that robots have about human commands, using four different robotic systems. | | |

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Focus on Human-Robot Awareness and Knowledge Exchange | It will provide knowledge about the type of awareness that humans have in relation to robot activities and reveal how robots are able to learn commands from humans, resulting in enhanced interactions between people and robots. | It may be relevant only to the particular robot systems which are used in this study and is not possible for it to have a direct impact on other robotics platforms or contexts. |
| **2** | Utilization of Four Unique Robotic Systems | | |
| **3** | Multifaceted Methodology | | |
| **4** | Advanced Data Processing and Analysis | | |

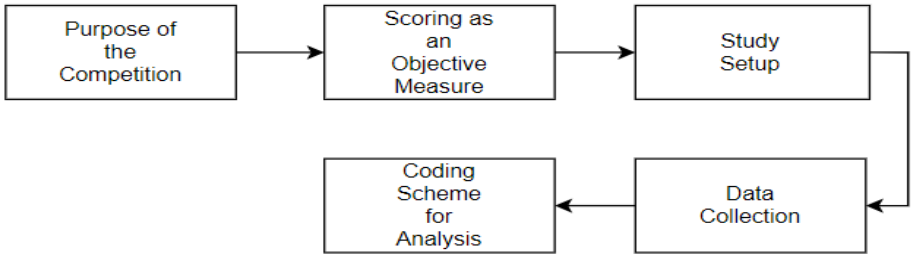
**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Reciprocal awareness between humans and robots, specifically focusing on how humans perceive robot activities and the extent to which robots understand human commands. | Variation in types of robotic systems used for this analysis, as four different systems are considered. | Level of autonomy in the robots or the roles assigned to humans in the collaborative activities. | Factors influencing the direct relationship between human awareness and robot knowledge, possibly encompassing the effectiveness of the human-robot interface. |

<table>
<tr><th colspan="3">Relationship Among The Above 4 Variables in This article</th></tr>
<tr><td colspan="3">The study looks into how different robotic systems affect the mutual awareness between humans and robots, as well as potential moderating and mediating factors that shape this relationship.</td></tr>
<tr><th>Input and Output</th><th>Feature of This Solution</th><th>Contribution in This Work</th></tr>
<tr><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>Four disticnt robots</td><td>Understanding human awareness of robot activities and the ability of robots to comprehend commands.</td></tr></table></td><td>The solution looks at what humans understand about robot activities and the reciprocal understanding of robots with each other in four different robotics systems. This research has looked at a complex dimension of understanding in the interaction between humans and robots.</td><td>Explaining how humans and robots have different forms of awareness, including the human perception of robot action as well as a robot's understanding of human commands. This has been accomplished by the examination of four different robotics systems.</td></tr>
<tr><th colspan="2">Positive Impact of this Solution in This Project Domain</th><th>Negative Impact of this Solution in This Project Domain</th></tr>
<tr><td colspan="2">It involves the interaction between humans and robots, in particular with regard to their awareness of robot activity and reciprocal comprehension of human commands. In order to examine these aspects in detail they use four different systems, and this shows the positive impact of their studies on developing relationships between humans and robots.</td><td>It could have been the result of a misinterpretation or an error in communication between humans and robots that led to confusion, even safety issues. Additionally, if the awareness mechanisms in the robotic systems are not well-designed, it may hinder effective interaction and trust-building between humans and robots.</td></tr>
<tr><th>Analyse This Work By Critical Thinking</th><th>The Tools That Assessed this Work</th><th>What is the Structure of this Paper</th></tr>
</table>

| | | |
|---|---|---|
| It looks especially at how humans and robots interact, with a focus on subtle forms of awareness among people and robots. It's evaluating these dynamics through four different robotic systems, with a view to learning about the complexities of mutual understanding and command execution. | Evaluating human awareness of robot activities | Abstract<br>I. Introduction<br>II. Related work on awareness<br>III. HRI awareness framework<br>IV. Applying the awareness framework<br>V. Discussion |

**Diagram/Flowchart**




Block Diagram of Procedure

**--End of Paper 7—**

**8**

| **Reference in APA format** | Noemí Pereda , Georgina Guilera , Maria Forns, & Juana Gómez-Benito, "The prevalence of child sexual abuse in community and student samples: A meta-analysis", April 2009 Clinical Psychology Review 29(4):328-38 DOI:10.1016/j.cpr.2009.02.007 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://publuu.com/flip-book/270696/634665/page/2 | Noemí Pereda , Georgina Guilera , Maria Forns, Juana Gómez-Benito | Child sexual abuse, Meta-analysis, Epidemiology, Prevalence. |

| The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc ) | The Goal (Objective) of this Solution & What is the problem that need to be solved | What are the components of it? |
|---|---|---|
| The prevalence of child sexual abuse in community and student samples. | Provide awareness of the global breadth of child sexual abuse, and to inform future research and initiatives in this area. | Election of studies, coding of studies, analysis of outliers, computation and combination of effect sizes, homogeneity test and analysis of moderators. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

It provides information about the selection and coding of studies related to child sexual abuse, as well as the analysis of outliers and computation of effect sizes.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Selection of studies | Provide valuable information about child sexual abuse, especially when cross-sectional or prospective studies are restricted due to legal and ethical reasons. | Risk of underestimating the number of real cases of sexual abuse in retrospective studies. |
| **2** | Coding of studies | | |
| **3** | Analysis of outliers | | |
| **4** | Computation and combination of effect sizes | | |
| **5** | Homogeneity test | | |

| | | | |
|---|---|---|---|
| **6** | Analysis of moderators | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Occurrence or frequency of child sexual abuse in community and student samples. | Various factors or interventions examined across different studies that may influence the prevalence of abuse. | Demographic factors or methodological differences among the studies that affect the strength or direction of the relationship between the independent and dependent variables. | Psychological or social mechanisms that explain how or why certain factors influence the prevalence of child sexual abuse. |

**Relationship Among The Above 4 Variables in This article**

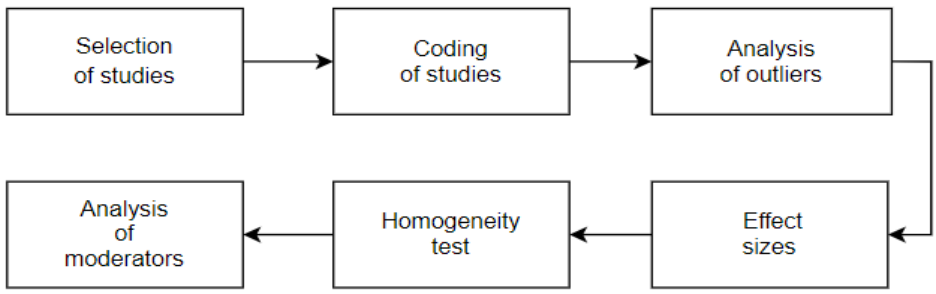
The analysis will most likely involve identifying patterns, outliers, and calculating effect sizes to better understand the nuanced relationships between these variables, which will contribute to a more comprehensive understanding of the factors influencing the prevalence of child sexual abuse.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input**: Data from various research studies on child sexual abuse<br>**Output**: Computed prevalence rates | With a significance level of.05., this study uses a meta-analysis to assess the prevalence of child sexual abuse across several studies, computing effect sizes, employing a random effects model, testing for study homogeneity, and exploring potential moderator variables as well. | To the extent this work is designed for the prevalence of child sexual abuse in community and student |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| In order to address the prevalence of child sexual abuse in community and educational settings, offer a sensitive and engaging educational tool. | Ignoring moral dilemmas or unforeseen repercussions when teaching kids about this delicate subject. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| Meta-analysis on the prevalence of child sexual abuse, explaining methodology, results, and limitations, but lacking particular conclusions or future study recommendations. | Instrument administration ,sampling techniques, as well as coding of studies and analysis of outliers. | Abstract<br>I. Introduction<br>II. Method<br>III. Results<br>IV. Discussion<br>V. Limitations<br>VI. Conclusions and Future search |

**Diagram/Flowchart**




Block Diagram of Proposed Method

**--End of Paper 8—**

| 9 | | |
|---|---|---|
| **Reference in APA format** | Ruhana Che Yusof, Mohd Noor Norhayati, & Yacob Mohd Azman, "Effectiveness of school-based child sexual abuse intervention among school children in the new millennium era: Systematic review and meta- analyses", Front. Public Health, 22 July 2022 Sec. Children and Health Volume 10 - 2022 \| https://doi.org/10.3389/fpubh.2022.909254 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.frontiersin.org/articles/10.3389/fpubh.2022.909254/full | Ruhana Che Yusof, Mohd Noor Norhayati, Yacob Mohd Azman | School-based intervention, child sexual abuse, knowledge, skills, attitude |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Effectiveness of school-based child sexual abuse intervention among school children in the new millennium era: Systematic review and meta-analyses | Assess the effectiveness of school-based initiatives in reducing child sexual abuse among children under the age of 18. | Study Characteristics,Intervention Programs,Outcome Measures,Risk of Bias Assessment,Measures of Treatment Effect,Data Synthesis |
| **The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process** | | |

A systematic search for articles on school-based child sexual abuse prevention or intervention programs was conducted from 2000 to 2022, yielding 30 studies.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Study Selection Process | This assists in identifying any research that may have outlier values when compared to the other studies, allowing for a more reliable data analysis. | Child sexual abuse was the only type of abuse studied; physical abuse, emotional abuse, and neglect were not included. |
| **2** | Data Extraction and Management Process | | |
| **3** | Assessment of Risk of Bias | | |
| **4** | Measures of Treatment Effect | | |
| **5** | Data Synthesis | | |
| **6** | Assessment of Evidence Quality | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Students' knowledge, attitudes, and behaviors regarding child sexual abuse. | Encompassing various methods and strategies employed in the school programs. | Demographic factors or variations in program implementation, influencing the intervention's impact differently across diverse contexts. | Psychological mechanisms through which the interventions exert their effects, such as changes in students' self-efficacy or |

| | | | |
|---|---|---|---|
| | | | communication skills. |

**Relationship Among The Above 4 Variables in This article**

Understanding how specific interventions influence students' responses and behaviors in preventing child sexual abuse in the school setting is dependent on the relationship between these variables.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output**<br>Extracted data from the studies / Evaluation of the program's effects | This school-based child sexual abuse intervention program employs a variety of tactics and tests, resulting in considerable increases in knowledge and skills among children under the age of 18, while also accommodating students from various grade levels and children with disabilities. | This study adds to the body of knowledge by establishing the effectiveness of school-based CSA intervention programs in improving knowledge, abilities, and attitudes among youth under the age of 18, providing significant information for future preventive program development. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| From 2000 to 2021, school-based CSA interventions benefited children under the age of 18 by improving their knowledge, skills, and attitudes about child sexual abuse, encouraging awareness, self-protection, and prevention. | The analysis did not include meta-regression, which could have provided more insights into the effectiveness of school-based CSA intervention programs. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| A systematic review and meta-analysis of 30 research on school-based child sexual abuse prevention programs are presented, revealing their effectiveness in improving knowledge, abilities, and attitudes. | Children's Knowledge of Abuse Questionnaire, Personal Safety Questionnaire | I. Introduction<br>II. Methods<br>III. Results<br>IV. Discussion<br>V. Conclusion |

**Diagram/Flowchart**

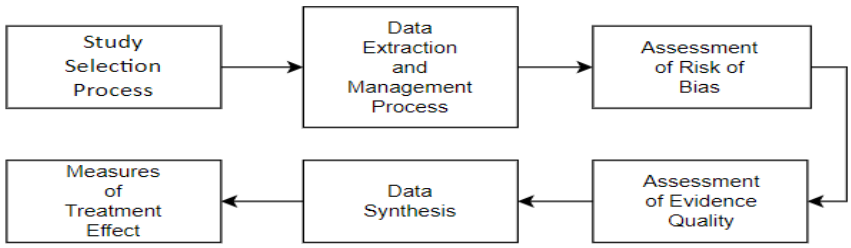



Figure 8: Block Diagram of Procedure

**--End of Paper 9—**

**10**

| Reference in APA format | Rimjhim Tyagi, & Bindu T Nair, "Assessment of awareness of 'good touch' and 'bad touch' in primary school children of a metropolis in North India", September 2023Sri Lanka Journal of Child Health 52(3):314-320 DOI:10.4038/sljch.v52i3.10574 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |

| | | |
|---|---|---|
| https://www.pdffiller.com/jsfiller-desk17/?requestHash=1418d426a608d913ec3d3a18bb34ae4c873fc02d7aa058d43687e2ea8478eb48&lang=en&projectId=1385855194&loader=tips&MEDIUM_PDFJS=true&PAGE_REARRANGE_V2_MVP=true&richTextFormatting=true&isPageRearrangeV2MVP=true&jsf-page-rearrange-v2=true&jsf-new-header=false&jsf-redesign-full=false&routeId=33256e1284c66de1b0412dec8cfe7e87#fc313083b5b548f7bb400c86a1269f6a | Rimjhim Tyagi , Bindu T Nair | Knowledge, Good touch, Bad touch, School children |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Assessment of awareness of ‘good touch’ and ‘bad touch’ in primary school | To use a pre-validated, structured questionnaire to determine primary school students' awareness of "good | Utilising a pre-validated, structured questionnaire to conduct an observational cross-sectional study with 200 students in two |

| | | |
|---|---|---|
| children of a metropolis in North India | touch" and "bad touch" in a North Indian metropolis. | schools in a North Indian metropolis. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

A structured, pre-validated questionnaire is given to primary school students in order to gauge their awareness and comprehension of "good touch" and "bad touch." After the data has been gathered, Statistical Package for the Social Sciences(SPSS) version 23.0 is used for analysis, and a reinforcement awareness programme is implemented in the school to teach kids about CSA.

| | **Process Steps** | **Advantage** | **Disadvantage (Limitation)** |
|---|---|---|---|
| **1** | Giving primary school students a structured, pre-validated questionnaire to gauge their awareness and comprehension of "good touch" and "bad touch." | Utilising statistical analysis software (SPSS) and a pre-validated questionnaire guarantees the accuracy and dependability of the data gathered, which can aid in the formulation of recommendations and well-informed decisions regarding future interventions. | A school-based reinforcement awareness programme may not be successful in teaching kids about CSA because programme efficacy varies based on a number of variables, including the calibre of the materials used, the mode of delivery, and the children's receptivity. |
| **2** | Gathering and utilising SPSS version 23.0 for data analysis. | | |
| **3** | Educating kids about CSA through a reinforcement awareness programme in the school, which involves displaying instructional | | |

| | | | |
|---|---|---|---|
| | films, booklets, flash cards, banners, and toys. | | |
| **4** | Based on the answers to the questionnaire, classifying the awareness (knowledge) levels as poor, average, good, and excellent. | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Children's comprehension and awareness of "good touch" and "bad touch." | Reinforcement awareness program implemented in the school to educate children about Child Sexual Abuse (CSA). | Parental involvement or socio-economic factors that influence the effectiveness of the awareness program | Reinforcement awareness program on enhancing children's understanding of 'good touch' and 'bad touch,' serving as a mediator in the relationship between the independent and dependent variables. |

**Relationship Among The Above 4 Variables in This article**

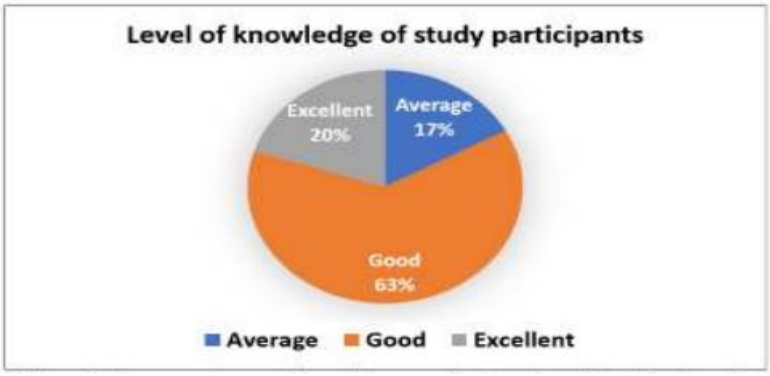
The SPSS analysis reveals statistical patterns and relationships between these variables, providing valuable insights for refining and tailoring future awareness campaigns.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output** | It gives insightful information about how much knowledge primary school students in North | The study provides insights on the lack of knowledge and highlights the necessity |

| | | | |
|---|---|---|---|
| Assessment of awareness of ‘good touch’ and ‘bad touch’ | Importance of educating children about to prevent child sexual abuse. | India have about "good touch" and "bad touch," and it highlights the importance of organised awareness campaigns to stop child sexual abuse. | of organised awareness campaigns to stop child sexual abuse. It also advises parents on the significance of educating their children about this delicate subject to protect their safety and wellbeing. |

| **Positive Impact of this Solution in This Project Domain** | **Negative Impact of this Solution in This Project Domain** |
|---|---|
| In addition to offering insightful information about the degree of awareness of "good touch" and "bad touch," the study highlights the necessity of structured awareness programmes to prevent child sexual abuse. | A heavy dependence on technology could alienate kids who don't have as much access to or experience with robots, which could lead to unequal learning opportunities. |

| **Analyse This Work By Critical Thinking** | **The Tools That Assessed this Work** | **What is the Structure of this Paper** |
|---|---|---|
| Using validated questionnaires, the study presents a methodical approach to evaluating children's comprehension of "good touch" and "bad touch," offering a trustworthy gauge of their knowledge in this important area. | Children's Knowledge of Abuse Questionnaire (CKAQ), Children’s Knowledge of Abuse Questionnaire-Revised (CKAQRIII) | Abstract<br>I. Introduction<br>II. Objectives<br>III. Method<br>IV. Results<br>V. Conclusion |
| **Diagram/Flowchart** | | |




Assessment Scores of Knowledge Regarding Good Touch and Bad tTouch

**--End of Paper 10—**

**11**

| **Reference in APA format** | Meghna Raj Saxena, Akarsh Pathak, Aditya Pratap Singh, & Ishika Shukla, "Real Time Object Detection", International Journal of Information Sciences and Application (IJISA). ISSN 0974-2255, Vol.11, No.1, 2019 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.ripublication.com/irph/ijisaspl2019/ijisav11n1spl_04.pdf | Meghna Raj Saxena,Akarsh Pathak Aditya Pratap Singh, Ishika Shukla | Object Detection, OpenCV, Python, Haar-features, Eye Detection, Face detection. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Real time object detection | The main goal of the present work was to introduce the concepts and techniques of | Author used machine learning algorithms and open cv library |

| | | |
|---|---|---|
| | computer vision and object detection. | for image processing and object detection. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

The author presented some basic concepts of Computer Vision and defined a tracking problem as a framework. The author also demonstrated some of the fundamental techniques implemented in Python OpenCV and MATLAB that can be used in object detection.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Feature extraction need to be done for different set of data. | Describes machine learning techniques on object detection for various algorithms with high accuracy and less error rate. | Several of the most advanced object detection models available today, particularly those built on deep learning, are intricate and could need a large amount of processing power for both training and inference. |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Accuracy of real-time object detection. | The implementation of different real-time object detection algorithms or techniques. | Environmental conditions, such as varying lighting levels, may moderate the effectiveness of real-time object detection. The impact of the detection | Processing speed or computational efficiency of the real-time object detection algorithm may mediate the relationship between the chosen algorithm |

| | | | |
|---|---|---|---|
| | | algorithm on accuracy may vary under different environmental conditions. | (IV) and the accuracy of object detection (DV). A faster algorithm may contribute to higher accuracy in real-time detection. |

**Relationship Among The Above 4 Variables in This article**

The choice of real-time object detection algorithm (IV) directly influences the accuracy of object detection (DV). The impact of the algorithm on accuracy may be moderated by environmental conditions (MV), and the process through which the algorithm influences accuracy may be mediated by processing speed or computational efficiency (MeV).

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output**<br>Image or video of the object to be identified. / Detecting object with the help of opencv and algorithms developed by machine learning. | Developing a model to detect object such that we can use this in our robot. | Good to have this knowledge from this paper as we are able to identify objects which in turn helps in classifying good touch and bad touch. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| Object detection has a wide range of positive impacts and applications across various fields. | Since this is a performance evaluation of various algorithms, not much to project on negative side as all the things used are defined in advance. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| This work is good, as they tried developing an object detection model with high low performances evaluation. | Opencv. | Abstract<br>I. Introduction<br>II. Features explanation<br>III. Implementation<br>IV. Result<br>V. Conclusion<br>VI. References |
| **Diagram/Flowchart** | | |
| | | |

**---End of Paper 11—**

**12**

| **Reference in APA format** | Kerem Altuna, & Karon E. MacLeanb, "Recognizing affect in human touch of a robot", November 2014 Pattern Recognition Letters 66 DOI:10.1016/j.patrec.2014.10.016 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.sciencedirect.com/science/article/abs/pii/S016786551400333X | Kerem Altun, Karon E. MacLean | Affective interfaces ,Haptic ,Human robot interaction, Affect recognition ,Gesture recognition. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |

| | | |
|---|---|---|
| Recognizing affect in human touch of a robot. | Touch is a key but understudied element; here, we explore its emotional content in the context of a touch robot. | Data quality, namely the sensors used and their ability to detect expressively informative touches. Recognition algorithm, delivering probabilities of a particular affective user state. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

The process of recognizing affect in human touch by a robot involves various stages and components, including sensing, interpretation, and response.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Machine Learning model selection for affect recognition. | It enables the development of a system that can interpret and respond to emotional cues through touch. | ML models for affect recognition require large and diverse datasets with annotated emotional labels. |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Accuracy in recognizing affect in human touch by the robot. | Different algorithms or methods used by the robot to recognize affect in human touch. | Cultural context may moderate the effectiveness of the robot in recognizing affect in human | Higher levels of user trust may enhance the robot's ability to accurately interpret |

| | | | |
|---|---|---|---|
| | | touch. The impact of the recognition algorithm on accuracy may vary across different cultural expectations and expressions of affect through touch. | and respond to affective touch. |

**Relationship Among The Above 4 Variables in This article**

The chosen recognition algorithm (IV) directly influences the accuracy of the robot in recognizing affect in human touch (DV). The impact of the algorithm on accuracy may be moderated by cultural context (MV), and the process through which the algorithm influences accuracy may be mediated by user trust in the robot (MeV).

| Input and Output | Feature of This Solution | Contribution in This Work |
|---|---|---|
| **Input**: Touching robot with different pressure levels.<br>**Output**: Says the type of the touch and says the emotional status of the person. | An interactive affective computing system requires automatic, real-time recognition of affect. | This work is good, Further investigation of human behaviour in different human-human, human-robot, human-pet interactions will improve applications involving emotion recognition. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| The impact of recognizing affect in human touch extends to various domains, including healthcare, education, customer service, therapy, and more. It has the potential to improve mental health, foster positive human-robot relationships, and enhance the overall well-being and emotional support of individuals interacting with robots. | Ethical considerations, privacy, and responsible data usage are critical to ensuring the responsible and beneficial use of this technology. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| Logically this is a good step that says the type of touch and it provides us with the information of emotional status of a person. | Tactile sensors<br>Camera<br>Touch sensors | Abstract<br>I. Introduction<br>II. Related Work<br>III. Methodology<br>IV. Analysis and discussion<br>V. Conclusions and future work<br>VI. Acknowledgements<br>VII. References |

| Diagram/Flowchart |
|---|
| |

**--End of Paper 12—**

**13**

| | | |
|---|---|---|
| **Reference in APA format** | Kul Pooja, Sunil Kumar Dular, & Suman Vashist, "Awareness of good and bad touch among children", May 2022International Journal of Health Sciences DOI:10.53730/ijhs.v6nS2.7410 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://sciencescholar.us/journal/index.php/ijhs/article/view/7410 | Kul Pooja, Sunil Kumar Dular , Suman Vashist | Awareness bad touch, child, education, good touch, sexual abuse, violence. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Awareness of good and bad touch among children | Our society needs to evolve in creating awareness platforms not only for parents, but for children too. | Creating awareness of good and bad touch among children is a collaborative effort that involves parents, caregivers, teachers, and communities. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

Creating awareness of good and bad touch among children involves a thoughtful and sensitive approach, often implemented through educational programs and communication strategies.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Children are educated about evaluation of good touch and bad touch. | Creating awareness of good and bad touch among children offers numerous advantages, as it plays a crucial role in child safety and well-being. | Teaching children about good and bad touch can sometimes lead to fear and anxiety. Children might become overly cautious or anxious about |

| | | | |
|---|---|---|---|
| | | | all physical contact, even when it is appropriate and safe. |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| This can be assessed through quizzes, interviews, or other methods to gauge children's understanding of what constitutes good and bad touch. | The educational program designed to teach children about good and bad touch serves as the independent variable. Different approaches to education may be tested to determine their effectiveness. | Cultural norms and values may moderate the effectiveness of the educational program. Different cultures may have varied perspectives on what is considered appropriate or inappropriate touch, influencing how the awareness program is received. | The level of communication children have with trusted adults (parents, teachers, counselors) can mediate the effectiveness of the educational program. Open communication allows children to seek guidance and clarification about good and bad touch, reinforcing the information learned in the program. |

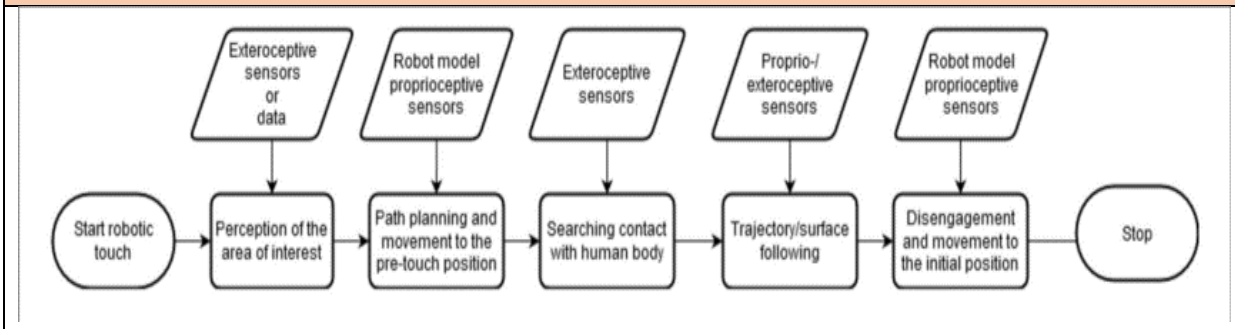
**Relationship Among The Above 4 Variables in This article**

The educational program (IV) directly influences children's knowledge of good and bad touch (DV). The impact of the program may be moderated by cultural context (MV), and the effectiveness of the program may be mediated by the level of communication children have with trusted adults (MeV). The combination of these variables contributes to the overall success of creating awareness of good and bad touch among children.

<table>
<tr><th>Input and Output</th><th>Feature of This Solution</th><th>Contribution & The Value of This Work</th></tr>
<tr><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>Child sensing the touch.</td><td>Child able to evaluate the type of touch with the involvement of a guardian.</td></tr></table></td><td>Empower children to be able to evaluate the touch.</td><td>It's helpful to have this information from the paper as we consider how to instruct kids on appropriate and inappropriate touch.</td></tr>
<tr><th colspan="2">Positive Impact of this Solution in This Project Domain</th><th>Negative Impact of this Solution in This Project Domain</th></tr>
<tr><td colspan="2">Raising children's understanding of appropriate and inappropriate touch has many benefits since it is essential to their safety and wellbeing.</td><td>It's possible that schools, parents, and other caregivers won't get enough training on how to properly teach kids about appropriate and inappropriate touch, which could result in mixed or unclear messages.</td></tr>
<tr><th>Analyse This Work By Critical Thinking</th><th>The Tools That Assessed this Work</th><th>What is the Structure of this Paper</th></tr>
<tr><td>This is an excellent piece of work because it aims to educate kids about right and wrong touch with the aid of a guardian.</td><td>Child awareness.</td><td>Abstract<br>I. Introduction<br>II. Types of child abuse<br>III. Ways of Identification of Abuse<br>IV. Impact of Abuse on a Child</td></tr>
</table>

| | | |
|---|---|---|
| | | V. Methods of Awareness Creation at Different Levels<br>VI. Conclusion<br>VII. References |

**Diagram/Flowchart**




Flow Chart of the Process

**--End of Paper 13—**

**14**

| | | |
|---|---|---|
| **Reference in APA format** | MIKE E. U. LIGTHART, MARK A. NEERINCX, & KOEN V. HINDRIKS, "It Takes Two: Using Co-creation to Facilitate Child-Robot Co-regulation", 2023 ACM Transactions on Human-Robot Interaction, Volume 12, Issue 4 Article No.: 42 pp 1–32https://doi.org/10.1145 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://dl.acm.org/doi/pdf/10.1145/3593812 | Mike e. ,U. Ligthart mark a. Neerincx, Koen v. Hindriks | Child-robot interaction, co-regulation, co-creation, user study |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |

| | | |
|---|---|---|
| It Takes Two: Using Co-creation to Facilitate Child-Robot Co-regulation | While interacting with a social robot, children have a need to express themselves and have their expressions acknowledged by the robot. | The study focuses on measuring the effectiveness and satisfaction of Interactive Design Paradigms (IDPs) for children and this also examines children's attitude towards the robot. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

It suggests a process of co-creation between children and robots to support co-regulation, emphasizing a collaborative relationship for emotional regulation.

| | **Process Steps** | **Advantage** | **Disadvantage (Limitation)** |
|---|---|---|---|
| **1** | The robot starts by expressing a need for specific content, such as a sound effect or gesture. The child is then given the option to either create the content themselves or have the robot download two pre-made options. | Creating the Content: The advantage of this step is that it allows the child to express | the study is the limited sample size and representation within the sample. |
| **2** | If the child chooses to create, they can choose between three levels of involvement: high (creating the content from scratch), mid (choosing between pre-made options), or low (letting the robot pick a pre-made option). The co-creation process aims to increase the child's agency | | |

| | | | |
|---|---|---|---|
| | and engagement with the robot | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| This could be measured through indicators of successful emotional regulation, collaboration, and mutual influence between the child and the robot. | This variable includes the specific activities, tools, or strategies employed to involve the child in the customization or design of the robot's features and behaviors. | Individual differences in children, such as age, personality traits, or prior experiences with robots, which may moderate the effectiveness of the co-creation process in facilitating co-regulation. | The emotional engagement of the child during co-creation sessions may serve as a mediating variable. |

**Relationship Among The Above 4 Variables in This article**

The co-creation mechanism (IV) is expected to directly influence child-robot co-regulation (DV). This relationship may be moderated by child characteristics (MV), and the process could be mediated by the level of emotional engagement during co-creation sessions (MeV). Understanding these relationships can provide insights into how co-creation contributes to successful child-robot co-regulation.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** \| **Output** | Active involvement of children in the design and development process fosters a sense of ownership and engagement | Aims to improve children's agency and co-regulation during social interactions with a robot. The study |

| | | | |
|---|---|---|---|
| Child expresses their feeling | Increased interaction between child and robot. | | found that the co-creation activity positively impacted children's engagement and acceptance of the robot, as well as their ability to co-regulate their emotions during the interaction. |

| **Positive Impact of this Solution in This Project Domain** | **Negative Impact of this Solution in This Project Domain** |
|---|---|
| The activity positively affects the acceptance of the robot, which is crucial for building trust and rapport between the child and the robot. | It is important to note that the study had some limitations, such as a limited sample size and a single-session interaction. |

| **Analyse This Work By Critical Thinking** | **The Tools That Assessed this Work** | **What is the Structure of this Paper** |
|---|---|---|
| It is a valuable contribution to the field of human-robot interaction. However, further research is needed to explore the long-term effects of the co-creation activity and to compare it to other approaches or interventions. Additionally, future studies should consider using larger sample sizes and more diverse populations to increase the generalizability of the results. | Qualitative and quantitative research methods statistical analysis | Abstract<br>I. Introduction<br>II. Related Work<br>III. Design Process and Structure<br>IV. User Study<br>V. Discussion<br>VI. Conclusion<br>VII. References |

| **Diagram/Flowchart** |
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| |

**--End of Paper 14—**

| 15 | | |
|---|---|---|
| **Reference in APA format** | Rachael Bevill Burns, Hyosang Lee, Hasti Seifi, Robert Faulkner, & Katherine J. Kuchenbecker, "Endowing a NAO Robot With Practical Social-Touch Perception", Front. Robot. AI, 19 April 2022 Sec. Human- Robot Interaction Volume 9-2022 https://doi.org/10.3389/frobt.2022.840335 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.frontiersin.org/articles/10.3389/frobt.2022.840335/full | Rachael Bevill Burns, Hyosang Lee, Hasti Seifi, Robert Faulkner, Katherine J. Kuchenbecker | Human-robot interaction, socially assistive robotics, social touch, affective touch, tactile sensors, gesture classification |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Endowing a NAO Robot With Practical Social-Touch Perception | The objective of this solution is to integrate touch perception into robots in order to enable them to mimic social touch interactions that commonly occur between humans. | Incorporation of contextual information to interpret touch in a social context. Understanding whether a touch is meant to convey comfort, support, or some other social cue is crucial for appropriate robot responses. |
| **The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process** | | |

The process involves equipping the NAO robot with the capability to perceive and respond to social touch through a combination of sensor calibration, machine learning, context integration, and user testing.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Collect a dataset of touch interactions to train and validate the robot's touch perception system. | Detection of Social-Touch Communication Cues: The tactile-perception system using fabric-based sensors has shown promising results in detecting necessary social-touch communication cues from users. | Classification Accuracy: The system's classification accuracy may be reduced due to the discarding of useful information about the intensity of contacts that occur. |
| **2** | Develop algorithms for processing the data collected by tactile sensors. This step involves filtering, feature extraction, and potentially the use of machine learning techniques to interpret touch signals. | Customizability: Fabric-based tactile sensors can be tailored to different robot body parts, allowing for versatility in their application. | Physical Design Implications: The exposed sides of the sensors can interfere with each other's signals when the edges of two sensors touch. |
| **3** | Incorporate contextual information into the touch perception system. Understand the social context in which touches occur to better interpret the meaning behind different touch interactions. | Engaging and Meaningful Interactions: The integration of touch perception through fabric-based tactile sensors enables robots to mimic social touch interactions that occur between humans. | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| This could be measured through indicators of the NAO robot's ability to accurately perceive and respond to social touches in real-world interactions. | The mechanism or system designed to endow the NAO robot with practical social-touch perception. | Individual differences in users, such as their familiarity with robots, comfort level with social touch, or cultural background, which may moderate the effectiveness of the NAO robot's social-touch perception. | The user's perception of the robot's responsiveness to social touch may serve as a mediating variable. |

**Relationship Among The Above 4 Variables in This article**

The touch perception system (IV) is expected to directly influence the practical social-touch perception of the NAO robot (DV). This relationship may be moderated by user characteristics (MV), and the process could be mediated by users' perceptions of the robot's responsiveness to social touch (MeV).

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output**<br>touch gesture classification / general touch location is determined and it is classified. | It can accurately detect social touch, including the contacted body part, force intensity, and gesture.The system utilizes tactile sensors that act as individual taxels. These sensors can capture both the gesture and force level conducted during touch interactions. | The value of this work lies in its potential to enhance human-robot interactions. By enabling robots to perceive and respond to touch, users can have more immersive and satisfying experiences when interacting with robots. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| It enables robots to mimic social touch interactions that are common between humans, providing users with more engaging and meaningful experiences in teaching, assistance, and companionship. | The exposed edges of the sensors can cause electrical shorting when they touch each other, leading to interference with the signals. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| The work aim to enable robots to mimic social touch interactions that commonly occur between humans in everyday life. The study includes a user study and physical sensor testing to develop a touch-perception system for robots. | Tactile sensor | Abstract<br>I. Introduction<br>II. Tactile sensor design and fabrication<br>III. User Study testing<br>IV. User Study results<br>V. Discussion<br>VI. Funding<br>VII. Conclusion<br>VIII. References |

| Diagram/Flowchart |
|---|
| |

**--End of Paper 15—**

| 16 | | |
|---|---|---|
| **Reference in APA format** | Manisha Praharaj, "Awareness of Good touch and Bad touch", january 2018i-manager's Journal on Nursing 8(2):1 DOI:10.26634/jnur.8.2.14497 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |

| | | |
|---|---|---|
| https://www.researchgate.net/publication/326809690_AWARENESS_OF_GOOD_AND_BAD_TOUCH_AMONG_CHILDREN | Manisha Praharaj | Good Touch, Bad Touch, Child Sexual Abuse, Violence Against Children, Awareness. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Awareness of Good touch and Bad touch | The aim is to help children become aware of the concepts of Good touch and Bad touch by involving their parents in the process. | The author discusses how parents play a crucial role in educating their children about recognizing the difference between appropriate and inappropriate physical contact and being aware of the signs associated with it. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

The process for raising awareness about good touch and bad touch among children involves Parents, Teachers, Child Protection Agencies, Health care professionals, etc.. The Author primarily involves parents. They are the key participants in educating their children about good touch and bad touch by teaching signs of sexual abuse and its effect on children.

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| 1 | Parents are educated about the importance of teaching | Children often feel most comfortable discussing sensitive topics with their | Some parents may not have the necessary knowledge to effectively |

| | | | |
|---|---|---|---|
| | their children about good touch and bad touch. | parents, creating a trusting environment. | educate their children on this subject. |
| **2** | Parents communicate with their children, discussing the differences between good and bad touch in an age-appropriate manner. Parents also help children in recognizing and understanding the signs of bad touch. | Children can learn about these concepts at a young age, which can be crucial for their safety. | Children may feel uncomfortable discussing such topics with their parents. |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Child's understanding of good touch and bad touch. | Parental involvement in teaching about good touch and bad touch. | Child's age or prior exposure to similar education. | Quality of communication between parent and child. |

**Relationship Among The Above 4 Variables in This article**

The article might explore how parental involvement impacts the child's understanding of good touch and bad touch (dependent variable) directly and indirectly through the quality of communication (mediating variable). Additionally, it could consider how the child's age or prior exposure to similar education (moderating variable) affects the effectiveness of parental involvement.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output** | Empower parents to be the primary educators in | Good to have this knowledge from this paper as we finding ways to teach |

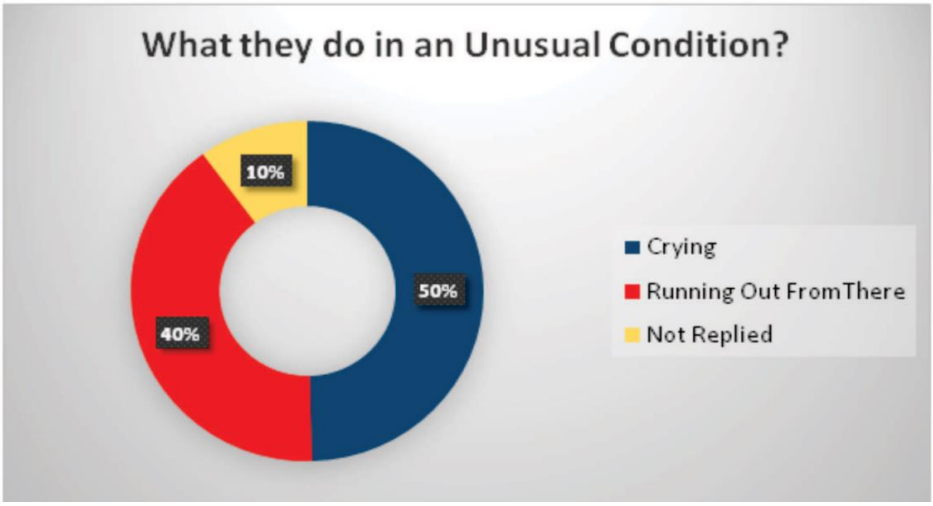
| | | | |
|---|---|---|---|
| Parental Involvement | Child Awareness in evaluating good touch and bad touch. | safeguarding children against harmful touch. | children about good touch and bad touch . |

| **Positive Impact of this Solution in This Project Domain** | **Negative Impact of this Solution in This Project Domain** |
|---|---|
| Parents play key role in educating their children and also they offer guidance that is customized to their child's age and level of maturity. | Some parents may lack the necessary knowledge to effectively educate their children on this topic. |

| **Analyse This Work By Critical Thinking** | **The Tools That Assessed this Work** | **What is the Structure of this Paper** |
|---|---|---|
| This work is good, as they tried to bring awareness among children with the help of parents in which children can gain knowledge about good and bad touch. | Parental Education. | Abstract<br>I. Introduction<br>II. Child Sexual Abuse<br>III. Signs and Symptoms of Sexual Abuse<br>IV. Adult's Signs in their Relationship with a Child for Sexual Reasons<br>V. Effects of Child Abuse |

| | | |
|---|---|---|
| | | VI. Awareness about Child Abuse<br>VII. Role of Parents<br>VIII. Conclusion |

**Diagram/Flowchart**




Status of the respondents to the Question what they do in an Unusual condition

**---End of Paper 16—**

**17**

| **Reference in APA format** | Fumihide Tanaka, & Javier R.Movellan, "Creating Humanoid Robot which assists children in real world", October 2006 DOI:10.1109/ROMAN.2006.314491 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.researchgate.net/publication/224058253_Behavior_Analysis_of_Children%27s_Touch_on_a_Small_Humanoid_Robot_Long- | Fumihide Tanaka and Javier R.Movellan | Good Touch, Bad Touch, Humanoid Robot, Early Childhood Education Center. |

| The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc ) | The Goal (Objective) of this Solution & What is the problem that need to be solved | What are the components of it? |
|---|---|---|
| Creating Humanoid Robot which assists children in real world. | To evaluate Good touch and bad touch created a humanoid robot which teaches children about different types of touch. | Training a robot which teaches children about good touch and bad touch with different life time examples. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| 1 | Programming and Behaviour Design | The robot can provide a safe and non-threatening environment for children to learn about this sensitive topic. | Limited adaptability of a humanoid robot in handling unique and complex situations. |
| 2 | Real-time Examples Database | | |
| 3 | Interactive Workshops | | |
| 4 | Feedback and Monitoring | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Child's understanding of | Use of the humanoid robot for teaching. | Child's age or developmental stage. | Quality of interaction between the child and the humanoid robot. |

| | | | |
|---|---|---|---|
| different types of touch. | | | |

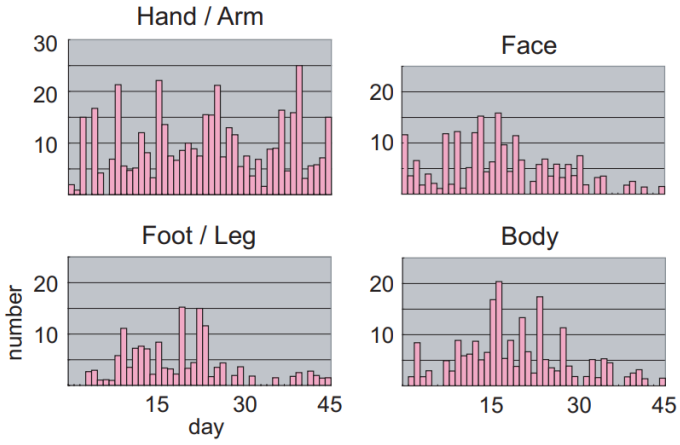
| Relationship Among The Above 4 Variables in This article |
|---|
| The effectiveness of the robot's teaching (independent variable) on the child's understanding (dependent variable) is influenced by the child's age or developmental stage (moderating variable). This impact is mediated by the quality of interaction and engagement between the child and the humanoid robot (mediating variable). |

| Input and Output | Feature of This Solution | Contribution in This Work |
|---|---|---|
| **Input**: Robot's sensors and cameras<br>**Output**: Robot's verbal and physical responses | This is simply an creation of humanoid robot which teaches good touch and bad touch. We can still integrate with another app which gives us even more better results. | Designing humanoid robot is a good thought, where good touch and bad touch are evaluated correctly. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| Humanoid robot is a good advancement to filter good touch, where two different touches are evaluated perfectly. | Potential desensitization of children to the seriousness of the issue. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| Logically this is a good step that filters good touch on multiple scenarios. Since this is static design new components can't be screen. | Humanoid Robot | Abstract<br>I. Introduction<br>II. Related Work<br>III. Experiment Results<br>IV. Conclusion |

| Diagram/Flowchart |
|---|




The Number of Children Touch on QRIO with Four Categories Each of which Represents a Form of Touch Based Interaction.

**--End of Paper 17--**

**18**

| **Reference in APA format** | Anja Austermann, & Seiji Yamada, "A Proposed Model for giving feedback to pet robot by using positive and negative rewards", September 2008 DOI:10.1109/ROMAN.2008.4600641 | |
|---|---|---|
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| **https://ieeexplore.ieee.org/abstract/document/4600641/figures#figures** | Anja Austermann, Seiji Yamada | Positive and negative feedback, Robot, Hidden Markov Models, Classical conditioning, Reinforcement Learning. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |

| | | |
|---|---|---|
| A Proposed Model for giving feedback to pet robot by using positive and negative rewards. | Giving Feedback to robot by using different models. | Hidden Markov Models, Classical conditioning. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Robot behavior is observed by human teacher during interactions. | HMM can help the robot understand patterns and sequences in feedback, improving the quality of responses. | To ensure successful implementation, a substantial amount of training data may be required. |
| **2** | Teacher categorizes the robot's actions as positive or negative feedback. | | |
| **3** | Hidden Markov Model is employed to model the user's feedback patterns. | | |
| **4** | Classical conditioning principles are used to associate specific robot actions with positive or negative feedback. | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Effectiveness of feedback in shaping the behavior of the pet robot. | Type and frequency of positive and negative rewards given as feedback. | Learning algorithm or adaptability of the pet robot. | Specific behaviors exhibited by the pet robot in response to the rewards. |

**Relationship Among The Above 4 Variables in This article**

The type and frequency of positive and negative rewards (independent variable) given as feedback potentially influence the behavior of the pet robot (dependent variable). This influence might vary based on the learning algorithm or adaptability of the robot (moderating variable).

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output**<br>Multimodal feedback / Adaptability to feedback | Can be derivable to other domains as well | To the extent this work is designed for the Education institutions for giving feedback to robot. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| Helps the robot understand what actions are favorable or unfavorable. | Use of negative rewards might raise ethical concerns about how we treat artificial entities. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|
| To teach robots to evaluate good and bad touch, they need to be trained via feedback. This allows for feedback to be given using different models. | Hidden Markov Models, Classical conditioning, Reinforcement Learning. | Abstract<br>I. Introduction<br>II. Related Work<br>III. Training Tasks<br>IV. Assumptions<br>V. Conclusion and Future work |

| Diagram/Flowchart |
|---|
| |

**--End of Paper 18—**

| 19 | | |
|---|---|---|
| **Reference in APA format** | Kerem Altuna, & Karon E. MacLeanb, "Recognizing affect in human touch of a robot", November 2014 Pattern Recognition Letters 66 DOI:10.1016/j.patrec.2014.10.016 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| https://www.sciencedirect.com/science/article/abs/pii/S016786551400333X | Kerem Altuna, Karon E. MacLeanb | Affective interfaces, Haptic, Human robot interaction, Affect recognition, Gesture recognition |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |
| Recognizing affect in human touch of a robot. | Developing a system for recognizing human touch of a robot. | Affect recognition, Gesture recognition |
| **The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process** | | |

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Participants imagine and express nine emotions in a 2-D affect space. They interact with a lap-sized robot equipped with pressure sensors and an accelerometer, using touch to express emotions. | Enhancing human-robot interaction through non-verbal communication. | Faced challenges in accurately interpreting diverse human emotions through touch. |
| **2** | Data is collected and then classified using random forest algorithm. Then classification rates are determined. | | |
| **3** | The research has implications for designing emotionally responsive robots and integrating unintrusive affect sensing into real-world interactions. | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|
| Accuracy of the robot in recognizing emotions conveyed through human touch. | Sensor technology or programming used in the robot for touch interpretation. | Contextual or cultural influences affecting touch interpretation. | Specific tactile cues or patterns identified by the robot in human touch. |

<table>
<tr><th colspan="3">Relationship Among The Above 4 Variables in This article</th></tr>
<tr><td colspan="3">The sensor technology and programming (independent variable) used by the robot to interpret human touch potentially influence its accuracy in recognizing emotions conveyed through touch (dependent variable). This recognition might be influenced by contextual or cultural factors (moderating variable), while the specific tactile cues or patterns identified by the robot serve as a mediator, aiding in the interpretation of emotions from human touch.</td></tr>
<tr><th>Input and Output</th><th>Feature of This Solution</th><th>Contribution & The Value of This Work</th></tr>
<tr><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>Human Touch</td><td>Emotion Recognition</td></tr></table></td><td>The solution entails advanced machine learning algorithms for emotion classification, utilizing pressure sensors and accelerometers in the robot prototype, and investigating the fusion of direct and inferred affect recognition to improve emotional comprehension and human-robot interaction.</td><td>Incremental learning is an added advantage of this classifier. So that when new stories of touch is also recognized and filtered.</td></tr>
<tr><th colspan="2">Positive Impact of this Solution in This Project Domain</th><th>Negative Impact of this Solution in This Project Domain</th></tr>
<tr><td colspan="2">Enhancing the emotional connection between humans and robots can lead to more empathetic and responsive interactions.</td><td>Risk of misinterpretation or insensitivity in robot responses, which could lead to user frustration.</td></tr>
<tr><th>Analyse This Work By Critical Thinking</th><th>The Tools That Assessed this Work</th><th>What is the Structure of this Paper</th></tr>
<tr><td>Evaluating the effectiveness of emotion recognition through touch interactions and assessing the feasibility of combining direct and inferred affect recognition. It provides</td><td>Affect recognition, Gesture recognition</td><td>Abstract<br>I. Introduction<br>II. Methodology<br>III. Analysis and Discussion</td></tr>
</table>

| | | |
|---|---|---|
| valuable insights into the potential for improving human-robot interactions and offers a foundation for designing emotionally responsive robots. | | IV. Conclusion |
| **Diagram/Flowchart** | | |
| | | |

**--End of Paper 19—**

**20**

| | | |
|---|---|---|
| **Reference in APA format** | Neeti Kushwaha ,Dautenhahn, Ben Robins, Filomena Soares,"The Dilemma of Good Touch and Bad Touch among visually Impaired Children", ISSN - 2348-2397 SHODH SARITA Vol. 7, Issue 26, April-June, 2020 Page Nos. 68-73 | |
| **URL of the Reference** | **Authors Names and Emails** | **Keywords in this Reference** |
| **https://www.academia.edu/44649164/THE_DILEMMA_OF_GOOD_TOUCH_AND_BAD_TOUCH_AMONG_VISUALLY_IMPAIRED_CHILDREN** | Neeti Kushwaha | Good, Bad, Touch, Child Sexual Abuse. |
| **The Name of the Current Solution (Technique/ Method/ Scheme/ Algorithm/ Model/ Tool/ Framework/ ... etc )** | **The Goal (Objective) of this Solution & What is the problem that need to be solved** | **What are the components of it?** |

| | | |
|---|---|---|
| The Dilemma of Good Touch and Bad Touch among visually Impaired Children. | Address child sexual abuse awareness and prevention. | It involves multifaceted role of touch in human life, highlighting its importance in maintaining healthy relationships and therapeutic contexts, while also acknowledging its potential for exploitation in cases like child sexual abuse. |

**The Process (Mechanism) of this Work; Means How the Problem has Solved & Advantage & Disadvantage of Each Step in This Process**

| | Process Steps | Advantage | Disadvantage (Limitation) |
|---|---|---|---|
| **1** | Importance of Touch | Touch is essential for building emotional bonds and maintaining healthy relationships, promoting a sense of trust and comfort. | Victims, especially visually impaired children, may not realize they've experienced abuse, making it a challenging problem to address. |
| **2** | Therapeutic Value | | |
| **3** | Gradual Manipulation | | |
| **4** | Perpetrator Familiarity | | |
| **5** | Lack of Awareness | | |

**Major Impact Factors in this Work**

| Dependent Variable | Independent Variable | Moderating variable | Mediating (Intervening ) variable |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Understanding of good touch, bad touch, and awareness of preventing sexual abuse among visually impaired children. | Educational methods and resources for teaching about good touch, bad touch, and preventing sexual abuse. | Support network and involvement of caregivers/educators. | Trust and open communication between visually impaired children and their caregivers/educators. |

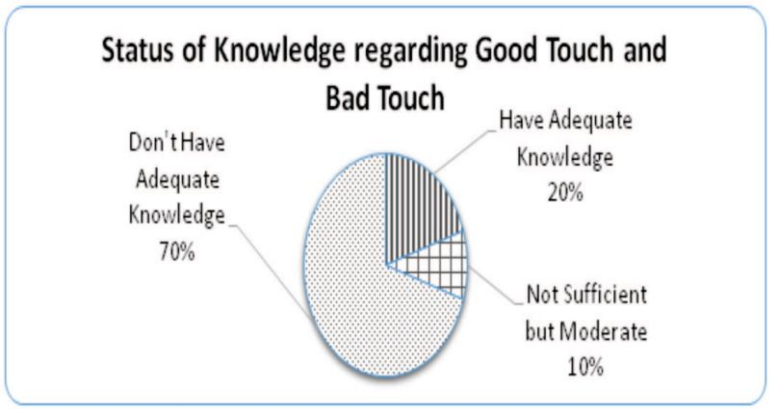
**Relationship Among The Above 4 Variables in This article**

The impact of educational methods and resources used to teach visually impaired children about good touch, bad touch, and preventing sexual abuse (independent variable) affects their understanding and awareness (dependent variable). The level of support and involvement from caregivers/educators (moderating variable) can influence this impact. Meanwhile, trust and open communication (mediating variable) play a crucial role in enhancing their comprehension and ability to disclose sensitive issues concerning touch and potential abuse.

| Input and Output | Feature of This Solution | Contribution & The Value of This Work |
|---|---|---|
| **Input** / **Output**: Touch / Child Sexual Abuse | The proposed solution involves raising awareness about the importance of touch in human interactions and the potential for exploitation, particularly in the context of child sexual abuse. | Good to have this knowledge from this paper as we review all the basic algorithms to evaluate touch. |

| Positive Impact of this Solution in This Project Domain | Negative Impact of this Solution in This Project Domain |
|---|---|
| Touch has therapeutic benefits, aiding relaxation, stress relief, and emotional well-being. | Child Sexual Abuse is often perpetrated by individuals known to the victim, making it harder to detect and report. |

| Analyse This Work By Critical Thinking | The Tools That Assessed this Work | What is the Structure of this Paper |
|---|---|---|

| | | |
|---|---|---|
| By raising awareness about touch to children they can evaluate good touch and bad touch. | Parents Teaching their children | Abstract<br>I. Introduction<br>II. Methodology<br>III. Analysis and Discussion<br>IV. Conclusion |
| **Diagram/Flowchart** | | |
|  <br>Status of Knowledge Regarding Good Touch and Bad Touch Among Respondents. | | |

**--End of Paper 20—**

## 2.2 Comparision Table

| Author | Year | Approach | Description |
|---|---|---|---|
| T. Kanda, H. Ishiguro, T.Ono, M.Imai, R.Nakatsu | 2002 | Humanoid Robot | This is a development of a Humanoid Robot named 'ROBOVIE' which aims to communicate with humans and participate in human society as a partner. |
| Jill L. Drury, Jean Scholtc, Holly A. Yanco | 2003 | Scoring algorithm using four different robotic activities. | This process uses scoring algorithm that examines the interaction between humans and robots by examining the types of reciprocal awarenessthat humans have about robot activities and the knowledge that robots have about human commands, using four different robotic systems. |
| Fumihide Tanaka, Javier R.Movellan | 2006 | HumanoidRobot | This is simply a creation of a humanoid robot that teaches good touch and bad touch. We can still integrate with another app which gives us even better results. |
| Anja Austermann, Seiji Yamada | 2008 | Hidden Markov Models, Classical conditioning, Reinforcement Learning | HMM can help the robot understand patterns and sequences in feedback, improvingthe quality of responses. |

| | | | |
|---|---|---|---|
| Noemí Pereda, Georgina Guilera, Maria Forns, Juana Gómez-Benito | 2009 | Comprehensive Meta-Analysis, Statistical package SPSS version15.0.1 | This study uses a meta-analysis to assess the prevalence of child sexual abuse across several studies, computing effect sizes, employing a random effects model, testing for study homogeneity, and exploring potential moderator variables as well. |
| Martin Saerbeck,Tom Schut, Christoph | 2010 | Robotic tutor using Interactive cat | This process aims to develop socialsupport behavior for robotics tutors in a language learning application, using the "interactive Cat" research platform. To achieve effective educational results, it is important to develop mechanisms for changing the level of social interaction. |
| Pierre Rouanet, Pierre-Yves Oudeyer, Fabien Danieau | 2012 | Visual words technique | It highlights how crucial well-designed interfaces are to enhancing both the user experience and the effectiveness of learning. |
| W. Bradley Knox, Peter | 2013 | TAMER. | Developing a robot by learning multiple feedback from users can help in detectinggood touch and bad touch. |

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|---|---|---|---|
| Stone, Cynthia Breazeal Bartneck, Maddy D. Janse | | | |
| Sandra Costa, Hagen Lehmann, Kerstin | 2014 | HumanoidRobot. | Enhance body awareness in autisticchildren through humanoid-robot interaction. |
| Kerem Altuna, Karon E. MacLean b | 2014 | Affect recognition, Gesture recognition | The solution entails advanced machine learning algorithms for emotion classification, utilizing pressure sensors and accelerometers in the robot prototype, and investigating thefusion of direct and inferred affect recognition to improve emotional comprehension and human-robotinteraction. |
| Manisha Praharaj | 2018 | Parental Education | Empower parents to be the primary educators in safeguarding children against harmful touch. |
| Ryo Midorikawa, Mihoko Niitsuma | 2018 | Handshake experiment using Pepper robot | This process is expected to explore the role played by physical contact, e.g. a handshake, in affecting humans' robot relationships which could include factors like sensory feedback, belief building, and emotions related toimproving interaction outcomes. |

| | | | |
|---|---|---|---|
| Megh na Raj Saxen a, Akars h Patha k, Adity a Pratap Singh, Ishika Shukl a | 2019 | Haar-Cascade classifier, OpenCV | Haar-classifiers have Haar-like features and machine learning algorithms that help in building a mathematical model for identifying objects like faces, watches, and pens to make our everyday life tasks easier. |
| Neeti Kushwa ha | 2020 | Parents Teaching their children | The proposed solution involves raising awareness about the importance of touch in human interactions and the potential for exploitation, particularly in the context of child sexual abuse. |
| Kerrui sh, Erika Macki e | 2021 | Tactile Robotics | This mainly explores the complications of touch in social robots, particularly in affecting touch integration. |
| Ruhana Che Yusof, Mohd Noor Norhay ati, Yacob Mohd | 2022 | "The children's knowledge of abuse questionnaire " (CKAQ), "The Personal Safety Questionnaire" (PSQ), "what if situation test"(WIST), "the | A systematic review and meta-analysis of 30 research on school-based child sexual abuse prevention programs are presented, revealing their effectiveness in improving knowledge, abilities, and attitudes. |

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|---|---|---|---|
| Azman | | body safety training program"(BST). | |
| Kul Pooja, Sunil Kumar Dular, Suman Vashist | 2022 | Educating children and awareness programs. | This process involved parents and their children. Parents teach their children about appropriate and inappropriate touch, along with examples of situations thatmay arise. |
| Rachael Bevill Burns, Hyosang Lee, Hasti Seifi, Robert Faulkner, Katherine J. Kuchenbecker | 2022 | NAO Robot | Tactile sensors are attached to NAO Robots and allow participants to perform fivedifferent types of affective touch gestures on sensorlocations with different intensities sensor data is used to train a gesture-classification algorithm that gave 74.1% accuracy of correct touch gestures. |

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|---|---|---|---|
| Rimjhim Tyagi, Bindu TNair | 2023 | Structured questionnaire | A structured, pre-validated questionnaire is given to primary school students in order to gauge their awareness and comprehension of "good touch" and "bad touch." After the data has been gathered, Statistical Package for the Social Sciences (SPSS) version 23.0 is used for analysis, and a reinforcement awareness program is implemented in the school to teach kids about Child Sexual Abuse. |
| Mike E.U. Ligthart, mark A. Neerincx, koen V. Hindriks | 2023 | User Study to improve child-robot interactions. | A user study was done with 59 school children to evaluate the co-creation that facilitates co- regulation and improves child agency in social interactions with robots. |

## 2.3 Work Evaluation Table

| | Work Goal | System's Components | System's Mechanism | Features/Characteristics | Performance | Advantages | Limitations/Disadvantages | Results |
|---|---|---|---|---|---|---|---|---|
| W Knox, Peter Stone, Cynthia Breazeal | The goal of the work is to apply the TAMER framework for learning from numeric human feedback to a physically embodied robot and demonstrate | The system's components include a physically embodied robot, a framework for learning from numeric human feedback(TAMER),and adjustments to address transparency challenges | The system uses the TAMER framework to learn from numeric human feedback. It applies the k-nearest neighbors algorithm for reward hypothesis (RH) modeling and uses a delay- | The system can train multiple behaviors without algorithmic modifications and without further guidance or evaluative feedback. It can learn from free-form human-generated feedback without | — | The system allows for training a physically embodied robot using human feedback, without the need for algorithmic modifications or evaluative feedback. | Since this is a performance evaluation of various algorithms, not much to project on negative side as all the things used are defined in advance. | — |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | the ability to train multiple behaviors. | specific to a physically embodied robot learning from human feedback. | weighted aggregate reward credit assignment system. | any additional guidance. | | | | |
| Martin Saerbeck, Tom Schut, Christoph Bartneck, and Maddy Janse | The goal of the research presented in the paper is to develop social supportive behaviors for a robotic tutor to | The tutoring application was implemented using the robotic research platform "interactive Cat" (iCat) from Philips Research. The | The tutoring application utilizes a state-based script interpreted by an "Interaction-Module" to trigger the behavior of the iCat | The iCat robot used in the tutoring application has the ability to express basic facial expressions and emotions, communicate through natural | The results of the study support that employing social supportive behavior in the robotic tutor increases the learning efficiency of students. | The use of social robots as tutoring applications provides an ideal research platform to investigate the effect of behaviors in a controlled and | To give the concept of good and bad touch an effective meaning, as well as ensuring that robots' behavior is age appropriate and sensitiv | The results of the study support that employing social supportive behavior in the robotic tutor increases the learning efficiency of students. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | be used in a language learning application and evaluate the effect of these behaviors on the learning performance of students. | iCat robot has a mechanical rendered face, 13 degrees of freedom to animate parts of the head, a camera, a microphone, four touch sensors, and an infrared distance sensor. | robot. The script is written in an XML-based interaction language called "Robot Interaction and Behavior Markup Language" (RIBML). The RIBML script contains commands for triggering animations, displaying expressi | modalities such as speech and gestures, and provide social feedback to the students. | | structured manner, which can lead to the development of best practices and guidelines for implementing tutoring applications. | e to cultural differences, it is necessary to accurately calibrate robot expressions. | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | ons, and interacting with situational awareness components such as speech recognition, card recognition, and face detection. | | | | | |
| Sandra Costa, Hagen Lehmann, Kerstin Dautenhahn, | The goal of the study was to increase body awareness in children with autism spectrum | The study used a child-like humanoid robot named KASPAR, which was equipped with | The robot, KASPAR, interacted with children with autism spectrum condition (ASC) and | KASPAR, the humanoid robot, was equipped with touch sensors to distinguish gentle from | Achieves around 90-95% more accurate outcomes and preserves both the spectral and anatomical data | This innovative approach offers a promising avenue for therapeutic interven | Data collection and analysis can be complex, and the study highlights the challenges involve | The study showed that children treated KASPAR as an object of shared attention with the experimenter and performed. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ben Robins, and Filomena Soares. | condition (ASC) by teaching them. | touch sensors to distinguish gentle from harsh touch and respond accordingly. | responded to their touch using its touch sensors. | harsh touch. | | tions in autism. | d in interpreting the data. | |
| Takayuki Kanda, Hiroshi Ishiguro, Tetsuo Ono, Michita Imai, and Ryohei | The goal of the work is to develop an interactive humanoid robot named "Robovie" that can communicate with | The system's components include a humanoid robot named "Robovie" that has physical expression abilities and a software architec | The system's mechanism involves the implementation of autonomous interactive behaviors to the robot through the developed | The robot "Robovie" has enough physical expression ability and is designed to interact with humans. | The performance of the robot's interactive behaviors was evaluated through psychological experiments to understand how humans recognize the robot. | The development of an interactive humanoid robot like "Robovie" can enable it to communicate with humans and participate in | Ensuring the safety of both the robot and its human users is critical. Humanoid robots need robust safety features | The experiments conducted to evaluate the robot's performance revealed how humans recognize the robot. However, specific results or findings are not mentioned in the provided sources. |

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|---|---|---|---|---|---|---|---|---|
| Nakatsu. | humans and participate in human society as a partner. | ture that incorporates important ideas obtained from cognitive experiments. | software architecture. | | | human society as a partner. | | |
| Erika Kerruish and Mackie. | The goal of the work is to explore the intricacies of touch in social robots, particularly the incorporation of affective | The paper discusses various research in tactile robotics, including touch in anthropomorphic robots and innovative, partially | it highlights the use of tactile sensors in social robots to measure touch and interpret it as hurtful or pleasurable, adjusting their respons | The paper emphasizes the importance of low-tech, material features in touching robots and the multivalent, imaginative, and mobile nature of touch. It | The infiltration of digital technologies into daily life conditions embodied agency in social robotics. | The paper suggests that considering the imaginative and low-tech aspects of touch in social robots can contribute to a better understanding of | The fact that affective computing in social robots ignores the ambivalence and conflicting emotions present in every emotional | Explores the dimensions and dynamics of affective touch in social robotics. |

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|---|---|---|---|---|---|---|---|---|
| | touch. It aims to go beyond functional and quantifying processes and consider the novel and imaginative aspects of touch in social robotics. | zoomorphic robots. It also mentions specific devices like MIT's Huggable and the therapeutic companion Probo, which have tactile sensors to measure force, temperature, and proximity. | es accordingly | also mentions the ambiguities and indeterminacies of affective touch and the interactivity of affect in generating the experience of touching social robots. | | affective touch and the dynamics of human-machine interaction. | experience is a drawback. | |
| Ryo Mid | The goal of | It describe | It mention | The paper | __ | The research | To avoid | The results of the study |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| orikawa and Mihoko Niitsuma | the research paper is to investigate the effects of touch experience on active human touch in human-robot interaction, with the aim of building better human-robot relationships. | s the interaction between humans and a robot, where the robot recognizes the subject, engages in conversation, and performs a greeting with a handshake. | s that the robot recognizes the subject, engages in conversation, and initiates a handshake as a form of physical contact. | focuses on the effects of touch experience on human-robot interaction and the importance of the recipient's perception of body contact. It also highlights the positive emotional effect of an initial handshake, which leads to further engagement with | | findings suggest that an initial handshake in human-robot interaction can have a positive emotional effect on the subjects, leading to increased engagement with the robot. | any unpleasantness or misinterpretation, the robot requires careful design and continuous refinement of its tactile feedback and response which is compatible with a wide variety of societal norms and personal | showed that an initial handshake in human-robot interaction produced a positive emotional effect in the subjects, leading to increased engagement with the robot. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | the robot. | | | preferences. | |
| Jill Drury, Jean Scholtc, Houy Yanco, Gaithersburg, Lowell | The work goal is to study awareness in human-robot interactions. | The system's components include human-robot awareness, activities, status information, surroundings, and overall understanding of joint goals and activities. | The system's mechanism involves teleoperated robots with wireless communication between the user interface and the robots. | The system focuses on HRI awareness, which includes understanding of locations, identities, activities, status, and surroundings of the robots. | __ | It will provide knowledge about the type of awareness that humans have in relation to robot activities and reveal how robots are able to learn commands from humans, resulting in enhanced interacti | It may be relevant only to the particular robot systems which are used in this study and is not possible for it to have a direct impact on other robotics platforms or contexts. | Understanding human awareness of robot activities and the ability of robots to comprehend commands. |

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| | | | | | | ons between people and robots. | | |
| Noemí Pereda, Georgina Guilera, Maria Forns, and Juana Gómez-Benito | The goal of the work was to conduct a meta-analysis of the prevalence of child sexual abuse in order to establish an overall international figure. | It includes election of studies, coding of studies, analysis of outliers, computation and combination of effect sizes, homogeneity test and analysis of | This examines the interaction between humans and robots by examining the types of reciprocal awareness that humans have about robot activities and the knowle | The prevalence of child sexual abuse was found to be 7.9% for men and 19.7% for women prior to the age of eighteen. | __ | The meta-analysis provides an overall international figure for the prevalence of child sexual abuse. | The study has limitations, including the use of retrospective studies and the need for a research protocol that is not biased by cultural variables or gender. | The meta-analysis found that 7.9% of men and 19.7% of women had suffered some form of sexual abuse prior to the age of eighteen. |

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| | | moderators. | dge that robots have about human commands, using four different robotic systems. | | | | | |
| Antonio Oliva, Jose Piqueras, S Awaludd in, Che Yusof, Norhaya ti Mn, | The goal of the study was to assess the effectiveness of school-based child sexual abuse (CSA) intervention | It includes study Characteristics, Intervention Programs,Outcome Measures,Risk of Bias Assessment,Measures of Treatme | A systematic search for articles on school-based child sexual abuse prevention or intervention programs was | — | — | This assists in identifying any research that may have outlier values when compared to the other studies, allowing for a | Child sexual abuse was the only type of abuse studied; physical abuse, emotional abuse, and neglect were not | The intervention programs were found to be effective in improving the knowledge, skills, and attitude of the students from pre-intervention to post-intervention and between the |

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| Mohd Azman, Ruhana Yusof, Noor Norhayati, and Yacob Mohd | programs among school children in the new millennium era. | nt Effect, Data Synthesis | conducted from 2000 to 2022, yielding 30 studies. | | | more reliable data analysis. | included. | intervention and control groups. |
| Rimjhim Tyagi and Bindu Nair | The goal of the study was to assess the awareness of 'good touch' and | It focuses on assessing the awareness and knowledge of 'good touch' and 'bad | It is a questionnaire-based cross-sectional study conducted on school children to | 1. The study included 200 children studying in Class III to Class VI in two schools in a | __ | The study provides insights into the awareness and knowledge of 'good touch' | A school-based reinforcement awareness programme may not be successf | 1. The study found that 61% of the children had some previous knowledge about 'good touch' and 'bad touch', while 39% |

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| | 'bad touch' among primary school children in a metropolis in North India. | touch' among school children. | assess their awareness and knowledge of 'good touch' and 'bad touch'. | metropolis in North India.<br>2. The children were assessed using a structured prevalidated questionnaire.<br>3. The study found that 61% of the children had some previous knowledge about 'good touch' and 'bad touch', while 39% | | and 'bad touch' among primary school children in a metropolis in North India. | ul in teaching kids about CSA because programme efficacy varies based on a number of variables, including the calibre of the materials used, the mode of delivery, and the children's receptivity. | were totally unaware. |

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| | | | | were totally unaware.<br>4. The scores obtained by the children were categorized as excellent (20%), good (63%), and average (17%). | | | | |
| Meghna Saxena, Akarsh Pathak, Aditya Singh,<br>Ishi | The goal of the system developed in the paper is to ease and augment everyd | The system uses a Haar-cascade classifier for object detection and OpenCV for implem | The system uses Haar-like features, which consider neighboring rectangular regions | The system is able to identify objects including face, eyes, smile, nose, watch, and phone. It can | The performance of an object detection model is typically evaluated using various metrics that assess its accuracy | The system uses Haar-like features, which are computationally efficient compared to | Several of the most advanced object detection models available today, particularly those built on | It can accurately detect social touch, including the contacted body part, force intensity, and gesture. |

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| ka Shukla. | ay life by using a Haar-cascade classifier for object detection, specifically focusing on face detection and object detection like watch detection and pen detection. | entation. | in a detection window, to categorize subsections of a video. It also utilizes AdaBoost and CART algorithms for training the classifier. | detect smiles on multiple faces, which is an improvement compared to previous OpenCV classifiers. | and efficiency. | working with RGB pixel values, making it faster on most platforms. | deep learning, are intricate and could need a large amount of processing power for both training and inference. | |
| Kerem Altun, Kar | The goal of the work is to explore | The system includes a lap-sized robot | The system uses touch gestures express | The system calculates several features for touch | the overall correct classification rate for the | The system provides a unique insight | The system's performance in recogni | The system's results include a correct classification rate of |

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| on Maclean | the emotional content of touch in the context of a furry robot pet and understand its nature and quality as a design tool for affective touch. It also aims to incorporate unintrusive affect sensing into deploy | prototype equipped with pressure sensors and an accelerometer to capture touch gestures. | ed by participants to recognize affective states. It explores the emotional content of touch and combines direct affect recognition with affect inferred from gesture recognition. | gesture recognition, including mean, median, variance, minimum, maximum, total variation, Fourier transform, peak, and corresponding frequency. | system is 36% for all participants combined and 48% on average for participants classified individually. The rates increase to 56% in the high arousal zone. | into the nature and quality of affective touch, which can be used as a design tool and for incorporating unintrusive affect sensing into deployed interactions. | zing affective states from touch gestures is not very high, with an overall correct recognition rate of 35.9%. It also does not take into account the closeness of emotional states. | 36% for all participants combined and 48% on average for participants classified individually. The rates increase to 56% in the high arousal zone. |

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| | ed interactions. | | | | | | | |
| Kul Pooja, Sunil Kumar Dular, and Suman Vashist | The goal of the work is to create awareness among children and adults about good and bad touch, specifically focusing on child abuse, especially sexual abuse. | It focuses on the need for educational and social institutes, as well as society as a whole, to play a significant role in creating awareness and protecting children from abuse. | It emphasizes the importance of education and awareness to help children and adolescents understand the difference between good and bad touch and protect themselves from | The paper highlights the impact of child abuse, particularly sexual abuse, on the mental health and overall development of children and young girls. It emphasizes the need for awareness and education to help | Creating awareness of good and bad touch among children involves a thoughtful and sensitive approach, often implemented through educational programs and communication strategies. | Creating awareness among children and adults about good and bad touch. It highlights the importance of protecting children from abuse, ensuring their mental health and overall development, | Teaching children about good and bad touch can sometimes lead to fear and anxiety. Children might become overly cautious or anxious about all physical contact, even when it is appropr | Child able to evaluate the type of touch with the involvement of a guardian. |

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| | | | abuse. | children distinguish between good and bad touch and protect themselves from trauma. | | and enabling them to live a normal life. | iate and safe. | |
| Vrije Amsterdam and M. Neerinc x. | he goal of the work is to facilitate co-regulation in child-robot interactions by developing a co-creation activity that allows childre | The system includes a social robot that interacts with children and a co-creation activity that enables children to create sound effects, gestures, and | The system facilitates co-regulation by allowing children to co-create with the robot, giving them agency and improving their ability to | The co-creation activity allows children to create sound effects, gestures, and light animations for the robot to use during their conversation. The system enables | Active involvement of children in the design and development process fosters a sense of ownership and engagement | Creating the Content: The advantage of this step is that it allows the child to express | the study is the limited sample size and representation within the sample. | Results from a user study with 59 school children (7-11 years old) showed that the co-creation activity successfully facilitated co-regulation by improving children's agency and positively affecting the acceptance |

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| | n to create sound effects, gestures, and light animations for the robot to use during their conversation. | light animations for the robot to use. | regulate the interaction. | children to coordinate their involvement in the co-creation process. | | | | of the robot. |
| Rachael Bevill Burns, Hyosang Lee, Hasti Seifi, Robert Faulkner | The goal of the work is to endow the NAO robot with practical social-touch perception by creatin | The system consists of fabric-and-foam-based resistive sensors installed on the curved surfaces of the NAO robot's | The fabric-and-foam-based resistive sensors detect touch gestures and force intensities applied by users on | The tactile-perception system can detect necessary social-touch communication cues, can be tailored to different robot | The gesture-classification algorithm achieved an average accuracy of 74.1% in identifying touch gestures and force intensities. | The low-cost, easy-to-build tactile-perception system allows researchers and caregivers to augment existing | Some misclassifications occurred due to participants performing unexpected behaviors during touch interacti | The gesture-classification algorithm achieved an average accuracy of 74.1% in identifying touch gestures and force intensities. Participants rated the sensor-equipped arm as |

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| , Katherine Kuchenbecker, Takashi Minato, Japan Riken, Rachael Burns | g a low-cost, easy-to-build, soft tactile-perception system that can detect social-touch communication cues from users and enable a variety of social-touch interactions. | left arm, including its hand, lower arm, upper arm, and shoulder. It also includes a gesture-classification algorithm based on a random forest for identifying touch gestures. | different sensor locations of the NAO robot's left arm. The gesture-classification algorithm analyzes the sensor data to identify the correct touch gesture and force intensity. | body parts, and provides HRI researchers with the tools needed to implement social touch in their own systems. Participants rated the sensor-equipped arm as pleasant to touch and liked the robot's presence significantly more after touch | Participants rated the sensor-equipped arm as pleasant to touch and liked the robot's presence significantly more after touch interactions. | rigid-bodied robots with touch-perception capabilities without the need for entirely new robotic systems. The system provides a dataset of sensor patterns and a characterization of the sensors' physical performance. | ons, such as conducting a different gesture than instructed. However, the use of limited instructions enabled the recording of participants' natural contact with the robot, creating a more general classification model. | pleasant to touch and liked the robot's presence significantly more after touch interactions. |

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| | | | | interactions. | | | | |
| Manisha Praharaj | The goal of the work is to describe the considerations for forming alternative configurations for a computer-based instructional management | The components of the system are data communications networks, loading/ distribution of data processing operations, Instructional Management System function | __ | Empower parents to be the primary educators in safeguarding children against harmful touch. | __ | Parents play key role in educating their children and also they offer guidance that is customized to their child's age and level of maturity. | Some parents may lack the necessary knowledge to effectively educate their children on this topic. | __ |

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| | system. | s, response time, computer software, andflexibility. | | | | | | |
| Fumihide Tanaka and Javier Movellan | The goal of the study was to conduct long-term observation of children's touch behavior on a small humanoid robot attending a nursery school | — | — | This is simply an creation of humanoid robot which teaches good touch and bad touch. We can still integrate with another app which gives us even more | — | Humanoid robot is a good advancement to filter good touch, where two different touches are evaluated perfectly. | Potential desensitization of children to the seriousness of the issue. | The paper reports findings on children's touch behavior on the robot based on video analyses. The results provide important conditions for designing everyday robots. |

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| | on a daily basis for more than three months. | | | better results. | | | | |
| S Yamada, Anja Austermann | The goal of the research is to analyze how users give positive and negative feedback to a pet robot through speech, gesture, and touch. | The system involves a pet robot as the interaction partner and users who provide feedback through speech, touch, and gestures. | The system uses a combination of Hidden Markov Models, classicalconditioning to enable the robot to learn the user's preferred ways of giving reward and | The tasks are designed to be easy and game-based to ensure natural and situated reward behavior. | — | The study allows for natural and unrestricted multimodal interaction with a robot, which is important for human-robot interaction. | Use of negative rewards might raise ethical concerns about how we treat artificial entities. | — |

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| | | | instruction. | | | | | |
| Kerem Altun and Karon Maclean | The goal of the work is to explore the emotional content of touch in the context of a furry robot pet and understand its nature and quality as a design tool for affective touch. | The system includes a lap-sized robot prototype equipped with pressure sensors and an accelerometer to capture touch gestures. | The system uses touch gestures expressed by participants to classify emotions. | The system calculates several features for touch gesture recognition,including mean, median, variance, minimum,maximum,total variation ,Fourier transform,and corresponding frequency. | The overall correct classification rate of the system within the 2-D grid of emotions is 36% for all participants combined and 48% on average for participants classified individually. | The system provides a unique insight into the nature and quality of affective touch, which can be used as a design tool and for incorporating unintrusive affect sensing into deployed interactions. | The system's performance in classifying emotions is relatively low, with correct classification rates ranging from 36% to 56%. | The system's results show the feasibility and best methods for classifying the gesture-giver's affective state based on touch data. touch sensing. |

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| D Sa R I T A, Neeti Kushwaha, | The goal of the work is to explore the level of knowledge regarding good touch and bad touch among visually impaired childre n, with a focus on child sexual abuse. | It involves multifaceted role of touch in human life, highlighting its importance in maintaining healthy relationships and therapeutic contexts, while also acknowledging cases like child sexual abuse. | It emphasizes the importance of educating visually impaired children about good touch and bad touch, as well as their private body parts. | The paper highlights the importance of differentiating between good touch and bad touch, educating children about their private body parts, and teaching them self defense. | — | The paper emphasizes the advantages of educating visually impaired children about good touch and bad touch, as well as their private body parts, to protect them from child sexual abuse. | Child Sexual Abuse is often perpetrated by individuals known to the victim, making it harder to detect and report. | — |

## 2.4 DISADVANTAGES OF EXISTING SYSTEM:

Concisely summarizing the disadvantages of the above implementations:

- Children who are not familiar with the concept of good and bad touch may not be able to recognize when they are being subjected to inappropriate behavior, making them more vulnerable to abuse.
- The training process for creating a Haar-cascade classifier using OpenCV requires considerable programming efforts and can be complex, especially during the installation process.
- Variations in facial images, such as viewing angles, illumination, and facial expressions, can cause random variations in the facial feature vector, leading to reduced accuracy in face recognition.
- The simplified algorithm used in the proposed architecture for real-time object detection using HOG feature extraction leads to a 3% degradation in accuracy at a false positive rate of 0.0001.
- HOG-based representation extracted from facial landmarks may have lower recognition rates compared to holistic PCA and LDA representations, especially when dealing with strong occlusions, pose changes, and illumination variations.
- SVMs can be computationally expensive and time-consuming, especially when dealing with large datasets, as they require solving a quadratic optimization problem for every training example.

# CHAPTER 3

# PROPOSED SYSTEM

## 3.1 PROPOSED SYSTEM

This is our suggested approach and it involves implementation of programmable robot which raises awareness on children especially about vital areas like good touch vs bad touch. The robot is equipped with Raspberry Pi for processing. Once the person's face is caught by the camera, the recognition system will go through the stages. With a facial identification procedure perceiving the child, the robot gets activated and more work. The platform detects a child's face to the smooth and directs to the tailored training session, giving the educational content which is targeted to the understanding and awareness of the proper touch behaviors. Sometimes the server will fail to detect the kid. In these sorts, the software will then generate a profile and safeguard stores parents' phone number in the child's profile by using intensive facial recognition algorithms. Post-training, the robot interacts live in real time with the child, requiring the child to actually touch it. Based on chosen sensors such as touch sensors, pressure sensors or flex sensors using nylon, it can recognize distinct touch scenarios. Such epitome of example could be an acceptable pressure from the part of the body that has been defined as a 'good touch' area, but a high pressure will be labelled as a 'bad touch' when it surpass 5 kHz. If a suspicious incident occurs, safeguarding procedures need to be promptly initiated by ensuring parents are aware via Twilio messaging system. With this realistic and all-inclusive rubric, children not only acquire technical knowledge but also develop a code to detect and react to various touching behaviours that will eventually lead to a safer and well-informed society.

## 3.2 OBJECTIVES OF PROPOSED SYSTEM

• Implement face detection and recognition using raspberry pi for child identification.

• Develop an educational module to raise awareness about good touch and bad touch.

• Enable the robot to seamlessly transition to tailored training sessions upon detecting a child's face.

• Utilize touch and pressure sensors to differentiate between various touch scenarios.

• Implement automated alert messaging to notify parents in cases of potential inappropriate touch interactions.

## 3.3 ADVANTAGES OF PROPOSED SYSTEM

The proposed system has the following advantages:

• A robot is programmed to offer the child educational materials, that are geared towards the child's mental development. So, the materials are tailored for age-appropriateness and relevance.

• Facial recognition technology helps in making the learning experience conversational formatted, which is interactive and unique to each child.

• The robot's ability to interact with the child in real time give an opportunity to provide an immediate review of the goals of learning and feedback.

• The robot can perform tasks such as touch detection with the help of sensors hence it can help to develop the knowledge of good and bad touch which can lead to the development of a more intuitive human behavior around the child.

## 3.4 SYSTEM REQUIREMENTS

This project contains some conditions that are essential for its successful development and implementation. This provides the training for children about how they have to practice safe touch, and personal boundaries while ensuring it's safe and secure.

### 3.4.1 SOFTWARE REQUIREMENTS

Below are the software requirements :

- **Raspberry Pi OS:** Raspberry Pi OS is essential in the Touch Robot project, enabling face recognition for identifying children and transitioning into tailored educational sessions about appropriate touch behaviors. It dynamically generates and stores child profiles for effective communication with parents when facial recognition fails. Equipped with touch and pressure sensors, Raspberry Pi facilitates real-time interaction with children, ensuring

seamless operation and empowering them with practical knowledge and response skills for a safer environment.

- **Python (version 3.x recommended):** It powers the Touch Robot project, integrating Raspberry Pi for processing and implementing face recognition for human behavior detection. Through Python's versatility, the system seamlessly transitions into tailored training sessions upon detecting a child's face, delivering educational content on touch behaviors. Python enables secure storage of child profiles and triggers automated alerts via Twilio for potentially harmful interactions detected by touch and pressure sensors. By leveraging Python's capabilities, the project promotes awareness and empowers children to respond appropriately to touch interactions, fostering a safer environment.
- **RPi.GPIO library:** It enables the Raspberry Pi in the Touch Robot to interface with touch and pressure sensors, allowing it to differentiate between good and bad touch interactions. By processing signals from these sensors, the robot can interpret tactile interactions with children and trigger alerts via Twilio in case of inappropriate touch scenarios. This integration enhances the robot's functionality, aiding in its mission to raise awareness about appropriate touch behaviors among children and promote a safer environment.
- **Pyttsx3 library:** It integrates speech synthesis into the robot, delivering customized educational content. It initiates informative sessions upon face detection, addressing appropriate touch behaviors. Pyttsx3 also handles profile generation and communication with parents in case of facial recognition failure. Through Pyttsx3, the robot engages children in interactive activities, providing auditory feedback to differentiate touch scenarios, promoting a safer environment.
- **Twilio Python library:** It enables the child safety robot to promptly alert parents about potential 'bad touch' scenarios detected via touch sensors. By leveraging Twilio's messaging capabilities, the system enhances awareness of appropriate touch behaviors among children, fostering a safer environment through real-time communication with parents.
- **OpenCV:** It enables facial recognition for child detection and personalized education. It detects faces, extracts features, classifies, and recognizes them, transitioning seamlessly into tailored training sessions on appropriate touch behaviors. If facial recognition fails, OpenCV generates profiles and securely stores parental contacts. It also helps differentiate touch scenarios using sensors, detecting bad touches and triggering automated alerts via Twilio to notify parents, fostering a safer environment for children.

- **SMBus library (for I2C communication):** It enables seamless communication among components in the touch robot system. With Raspberry Pi as the central processor, the robot employs face recognition to detect children's faces, delivers tailored educational sessions, and securely stores profiles if facial recognition fails. Equipped with touch and pressure sensors, the robot distinguishes between 'good touch' and 'bad touch,' triggering automated alerts via Twilio if necessary. The SMBus library ensures efficient coordination, fostering a safer learning environment for children.
- **Development environment:** A Raspberry Pi-based environment integrates advanced face recognition technology. This system identifies children's faces, initiates tailored educational sessions on touch behavior, and stores parent contact information for alerts if recognition fails. Equipped with touch and pressure sensors, the robot distinguishes between 'good touch' and 'bad touch,' sending automated alerts via Twilio to parents for prompt intervention. This approach empowers children with practical knowledge and promotes safer interactions, fostering a more informed environment.

### 3.4.2 HARDWARE REQUIREMENTS

Hardware requirements for successful development and implementation are as follows:

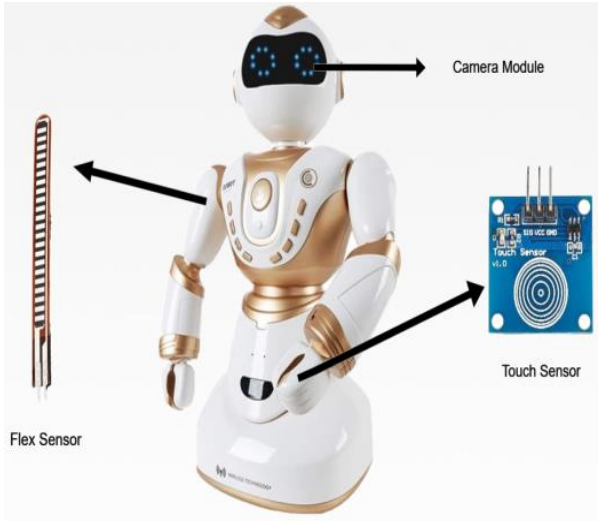


Figure 2: Placement of Hardware Components

- **Robot:** The robot serves as an engaging and interactive medium through which children can learn about crucial topics such as good touch and bad touch. Its integration with face recognition technology enables personalized training sessions tailored to each child's needs, ensuring effective education delivery. Additionally, the robot's ability to detect and differentiate between various touch scenarios through touch and pressure sensors enhances its role as a teaching tool, providing real-time feedback to children on their interactions. Moreover, the robot's capacity to automatically alert parents in case of potentially harmful touch interactions adds an essential layer of safety and intervention, ensuring prompt awareness and action when necessary. Ultimately, the robot plays a pivotal role in creating a safer and more informed environment for children, empowering them with practical knowledge and skills to navigate interpersonal interactions confidently.
- **Raspberry Pi**: Raspberry Pi handles interactions with touch sensors, reads analog Input from flex sensors performs facial recognition, manages notifications, and controls the robot's overall behavior. The RPi.GPIO library is used to interact with the Raspberry Pi's GPIO pins. These pins are configured to read input from the touch sensor. These touch sensors will be used to detect physical interactions with robots. It also takes advantage of the Raspberry Pi's I2C (internally integrated circuit) functionality to read analog input from the switch. Raspberry Pi integrates with Twilio's API to send SMS alerts. Twilio allows sending SMS messages, and the Raspberry Pi interacts with the Twilio API to send notifications to predefined phone numbers when a vulnerability is detected.
- **Raspberry Pi Camera:** A Raspberry Pi camera is used to capture images of the child's face. These images can be processed using facial recognition algorithms to identify the child's face. The name of the recognized face will be displayed, which will then be captured and processed by the main script (ChildSafetyRobot) to determine the appropriate response.
- **Touch Sensor:** Touch sensors are used as input devices to detect physical interactions. The touch sensor receives input in the form of electrical signals. When a touch is detected, the sensor emits a high signal (logic 1) indicating contact. On the contrary, when there is no contact, a low signal (logic 0) is given, indicating that there is no contact. These pins are configured as inputs to read the signals from the touch sensors.

- **Pressure Sensor(Flex):** The flex sensor is used to measure pressure, which is then used in conjunction with the touch sensor input to determine whether the touch is good or bad. This decision is made by comparing the output of the flex sensor with a predefined threshold value. The flex sensor threshold is set to 245. The read_flex_sensor method reads the analog input from the flex sensor. It communicates with the sensor via I2C protocol and reads the analog value at (0x48). The simulated value is then returned; this ranges from 0 to 255.
- **PCF8591 ADC-DAC Converter:** The PCF8591 ADC-DAC converter module enhances the touch sensing system by providing analog operating instructions to detect changes in pressure or force specifically applied to the flexible sensor. The read_flex_sensor method is responsible for reading the analog output from the Flex sensor connected to the PCF8591 module. In this method, the smbus module is used to read one byte of data from the PCF8591 module on channels. The value of the flex sensor is used to detect bad touches. If the touch event is detected when the sensor is above the threshold, it is considered a bad touch. This will help simulate a real-life situation where Bad touch could involve applying pressure or force to the sensor.

### 3.4.3 IMPLEMENTATION TECHNOLOGIES

**Face Recognition:**

The face recognition process involves several key steps to accurately identify and classify faces within an image or video feed.

1. Face Detection: Initially, the system detects the presence of a face within the robot's field of view. This is typically achieved using Histograms of Oriented Gradients(HOG). Once a face is detected, the system proceeds to the next step.

2. Feature Extraction: Once a face is detected, relevant features such as the distance between eyes, nose shape, and mouth curvature are extracted. These features are crucial for distinguishing between different faces and are typically represented as a high-dimensional feature vector.

3. Classification: The extracted features are then compared against a database of known faces or templates. This comparison is done using machine learning algorithm such as Support Vector

Machines (SVM). The goal is to classify the input face into one of the predefined classes, which could represent individuals or categories such as "child" or "adult."

4. Recognition: Based on the classification results, the system identifies the individual if the input face matches one of the known faces in the database. If a match is found, relevant information associated with that individual, such as their name or profile, is retrieved. If no match is found, the system may dynamically generate a profile or prompt the user to provide additional information for identification.

**HOG Algorithm(Histogram of Oriented Gradients):**

The Histogram of Oriented Gradients (HOG) algorithm is a widely used method in face recognition for its effectiveness in capturing the local appearance and shape information of objects, including faces, within an image. The Histogram of Oriented Gradients (HOG) algorithm divides an image into cells, computes gradient orientation histograms for each cell, groups adjacent cells into blocks, and normalizes them for lighting and contrast variations. The resulting histograms form a feature vector representing the image's texture and shape, suitable for classification using machine learning algorithms like SVMs or neural networks. HOG is effective in face recognition for capturing local appearance and shape information, enabling accurate identification in different conditions.

**SVM Classifier(Support Vector Machine):**

Support Vector Machine (SVM) plays a pivotal role in the face recognition process within the proposed Touch Robot project. SVM, a supervised learning algorithm, is utilized for classification following the feature extraction stage in face recognition. Once a face is detected and its features are extracted, SVM helps classify these features into different categories, enabling the system to recognize specific individuals. SVM works by finding the optimal hyperplane that best separates the extracted features into distinct classes, such as identifying different individuals based on their facial characteristics. Through training on a dataset of known faces and their corresponding features, SVM learns to accurately classify new faces it encounters. In the context of the Touch Robot project, SVM ensures robust and reliable facial recognition capabilities, facilitating seamless transitions into tailored training sessions and contributing to the overall effectiveness of the system in fostering understanding and awareness of appropriate touch behaviors among children.

# CHAPTER 4

# SYSTEM DESIGN

## 4.1 PROPOSED SYSTEM ARCHITECTURE

The proposed system, named Touch Robot, involves the development of an interactive robot equipped with Artificial Intelligence capabilities for human behavior detection. This robot integrates various modules to facilitate its functionality.

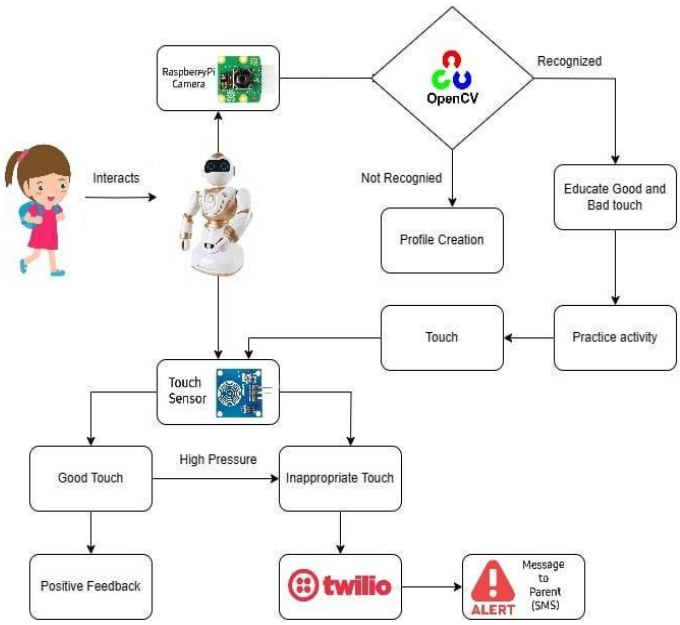


Figure 3: Proposed Architecture

## 4.2 MODULES

On an overall involves four main modules, which cater to the four main functions of this implementation, i.e., to identify children and provide interactive learning for childern and also to provide real time feedback and awareness to the society of major issues taking place now a days .

### 4.2.1 Face Recognition:

In the proposed system, the creation of a child safety profile begins with the definition of a class named `ChildSafetyRobot`. This class encapsulates functionalities for initializing the robot and managing child data. The data collection process leverages a Raspberry Pi camera and OpenCV, a computer vision library, to capture the child's image and input essential details such as their name, parents' information, and contact number.

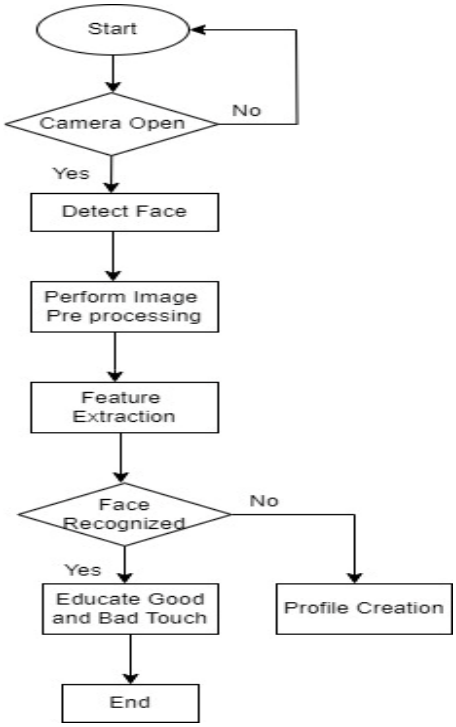


Figure 4: Process of Face Recognition

Once the data is collected, it is utilized to create a model within the system. This model serves as a reference for the robot to recognize and interact with the child. The model utilizes the Histogram of Oriented Gradients (HOG) algorithm, a powerful technique for feature extraction, to identify the child's face within captured images or video frames. Upon successful detection, the robot initiates interaction with the child.

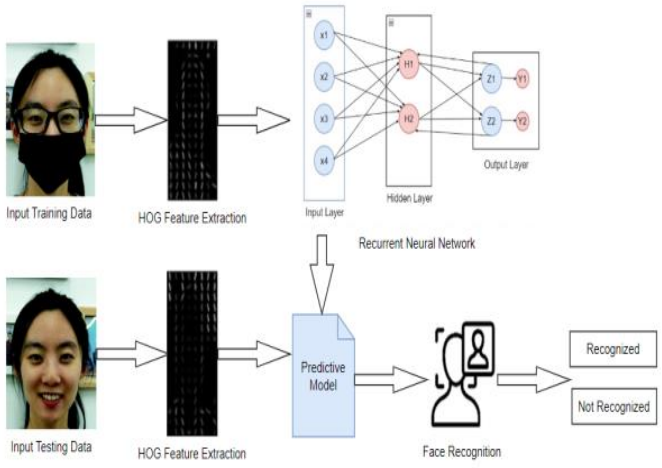


Figure 5: HOG Algorithm

In instances where the child's face is not detected, indicating the absence of a profile or an update is required, the robot prompts the user to input the necessary information to create or modify the child profile. This ensures that the system stays up-to-date and capable of accurately recognizing children under its care.

After the initial detection and interaction phase, the system employs Support Vector Machine (SVM) classifiers to differentiate between individuals based on their facial expressions. This capability enhances security coordination and monitoring by enabling the robot to distinguish between authorized individuals and potential threats.

This iterative process of data collection, model creation, facial recognition, and interaction ensures continuous improvement in the robot's ability to recognize children and establish effective communication and relationships with them. Ultimately, this contributes to creating a safer environment by enhancing child safety and security through advanced technology integration.

### 4.2.2 Interactive Learning:

In the proposed system, feedback based on touch plays a crucial role in shaping children's behavior and ensuring their safety. When the system detects a good touch, it responds with positive reinforcement, fostering a healthy relationship between the child and the robot. This affirmation not only validates the child's actions but also builds trust and confidence in their interactions with the technology. By consistently providing positive feedback for appropriate behaviors, the system encourages children to engage in safe and respectful touch interactions, thereby promoting a secure environment for their development.

Conversely, if a bad touch is identified, the system promptly notifies the parent or guardian, enabling swift intervention to address any safety concerns. This proactive approach empowers parents with real-time information, allowing them to take necessary steps to protect their children from potential harm, thereby enhancing overall safety and security. Moreover, the feedback mechanism contributes to raising awareness about appropriate touch behaviors among children, fostering a supportive environment where they can learn and grow with confidence. Through transparent communication channels such as parental reports, the system provides additional oversight and accountability, further bolstering child safety and well-being.

### 4.2.3 Real-Time Feedback:

In the proposed system, feedback based on the touch received is a fundamental aspect that serves multiple purposes in ensuring child safety and fostering a healthy environment. Firstly, when a good touch is detected, the system provides positive reinforcement, creating a sense of affirmation and trust between the child and the robot. This positive feedback helps in reinforcing appropriate behavior and encourages the child to engage in further interactions with the robot, facilitating the learning process.

Conversely, if a bad touch is detected, the system promptly sends a warning message to the parent or guardian. This swift notification enables parents to intervene immediately if necessary, ensuring the safety and well-being of the child. By involving parents in the monitoring process, the system empowers them to actively participate in safeguarding their children's health and rights, thereby strengthening the overall safety net around the child.

Moreover, this feedback mechanism contributes to creating a safe and caring environment where children feel protected and nurtured. By promoting healthy interactions and raising awareness about appropriate touch behaviors, the system educates children about personal boundaries and empowers them to recognize and respond to potential risks effectively.

Furthermore, the transmission of feedback through parental reports serves as an additional layer of protection, helping to prevent unnecessary interactions and potential dangers. By keeping parents informed about their children's interactions with the robot, the system ensures transparency and accountability, thereby enhancing overall child safety.

In summary, the feedback mechanism in the proposed system not only reinforces positive behavior but also empowers parents, promotes a safe and caring environment, raises awareness about appropriate touch behaviors, and prevents unnecessary interactions, all contributing to the overarching goal of ensuring child safety and well-being.

### 4.2.4 Parental Notification:

In the proposed system, the swift alert mechanism activated upon detecting inappropriate touching plays a crucial role in ensuring the safety of children. By promptly notifying parents through the Twilio interface, the system provides an immediate warning of potential danger to their child, allowing for quick intervention and protection. This proactive approach not only raises awareness

of potential risks but also empowers parents to take decisive action to safeguard their child's well-being. The integration of technology and education in the system underscores its commitment to prioritizing the safety and welfare of young people. By seamlessly combining technological capabilities with educational content, the system creates a comprehensive approach to addressing child safety concerns. Through this integration, the system not only identifies and responds to potential threats but also educates children and parents about appropriate behaviors, fostering a culture of safety and respect.

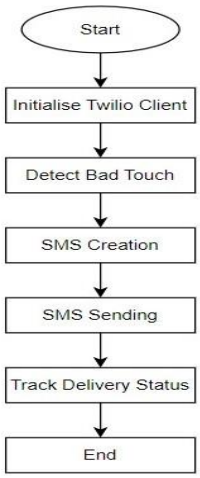


Figure 6: Internal Processing of Twilio Interface

Moreover, the utilization of the Twilio interface enhances the effectiveness of the system's alert mechanism. By leveraging Twilio's messaging platform, the system ensures reliable and timely delivery of alerts to parents, enabling them to respond swiftly to any safety concerns regarding their child. This seamless integration of Twilio facilitates proactive communication between the system and parents, empowering them to stay informed and take immediate action to address any potential risks. Overall, the combination of technology, education, and proactive communication in the proposed system creates a secure and nurturing environment for children to grow up safely, fostering a culture of safety and well-being within families.

## 4.3 UML Diagrams

UML stands for Unified Modelling Language. UML is a standardized general-purpose modelling language in the field of object-oriented software engineering. In its current form, UML comprises of two major components: a Meta-model and a notation. The Unified Modelling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modelling and other non-software systems. The UML uses mostly graphical notations to express the design of software projects.

### 4.3.1 Use Case Diagram

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.

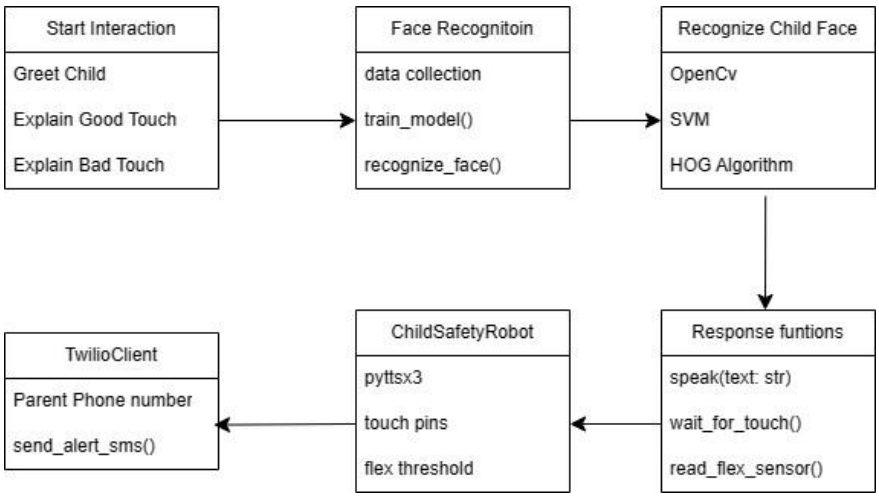


Figure 7: Use Case Diagram

### 4.3.2 Class Diagram

In software engineering, a class diagram in the Unified Modelling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.

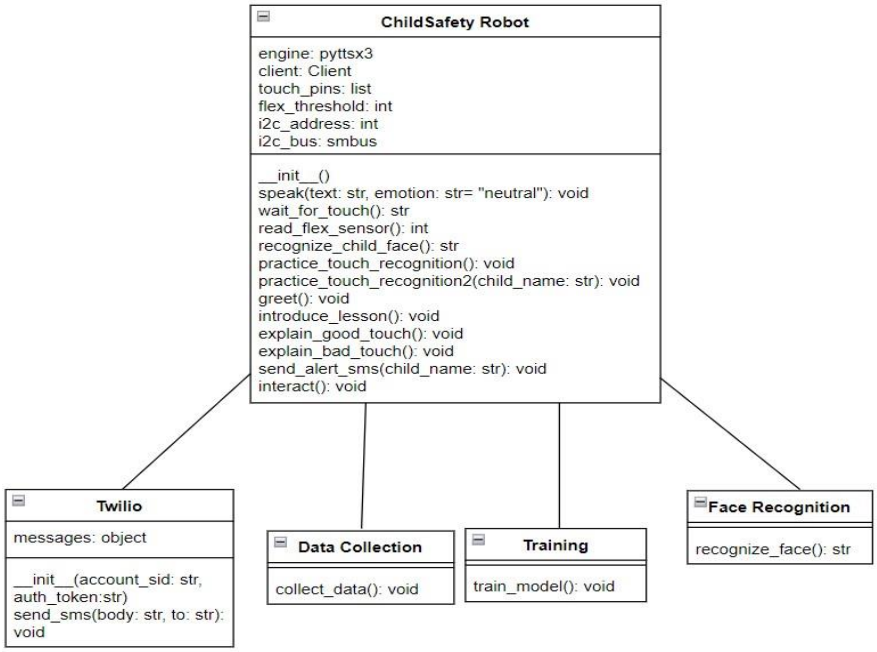


Figure 8: Class Diagram

## 4.3.3 Sequence Diagram

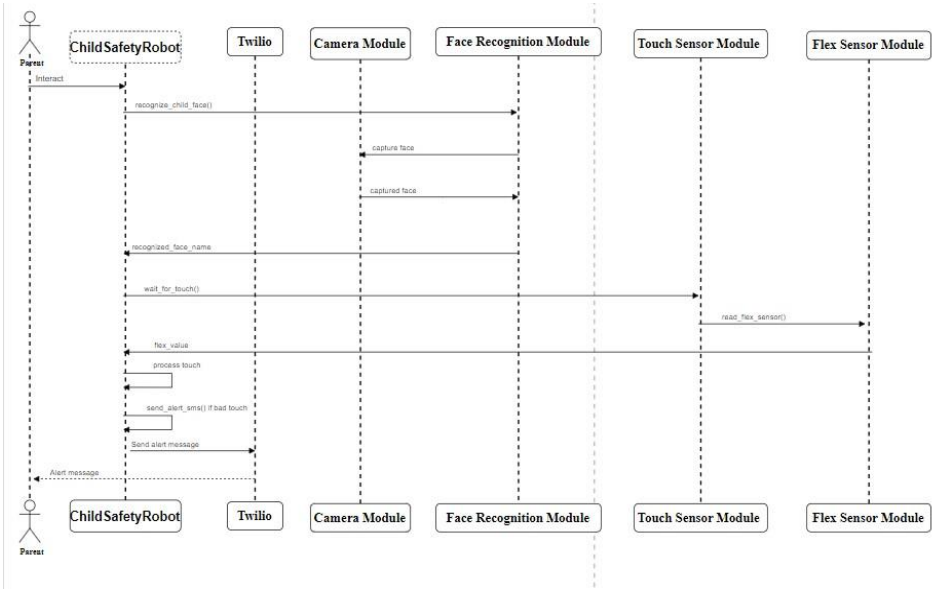


Figure 9: Sequence Diagram

## 4.3.4 Activity Diagram

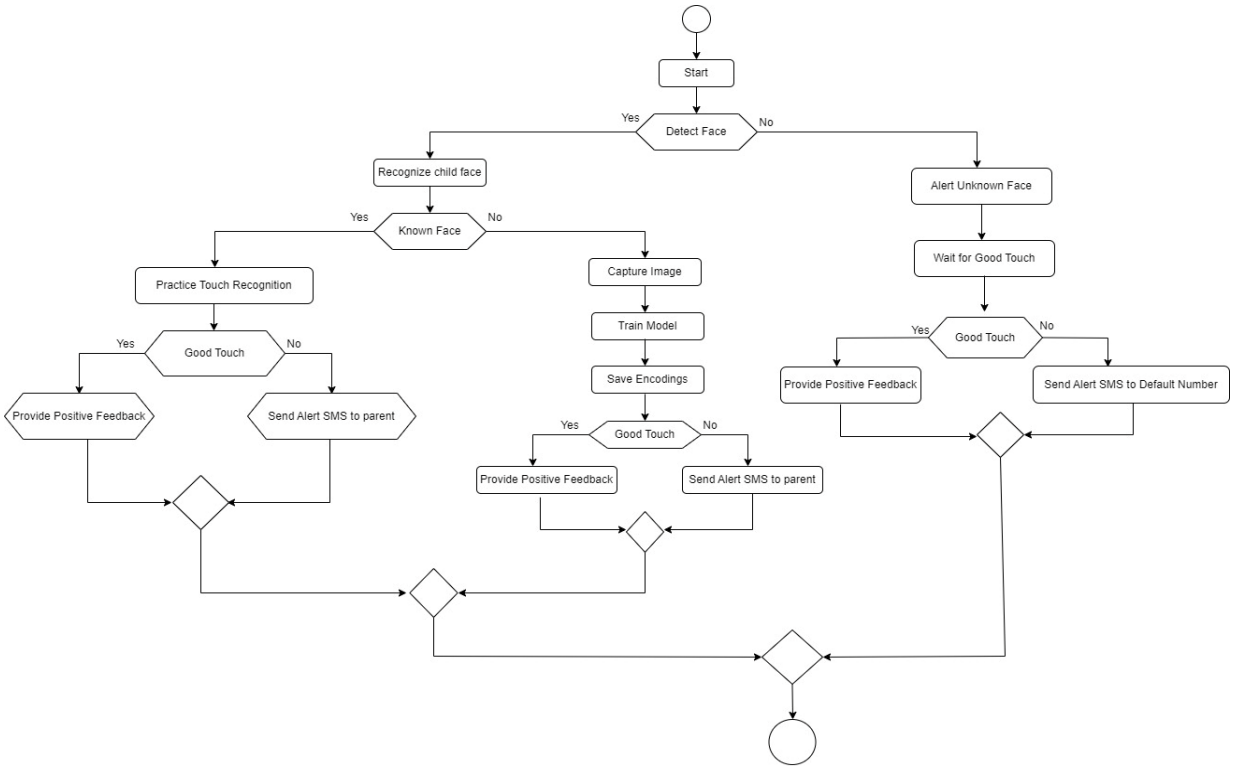


Figure 10: Activity Diagram

# CHAPTER 5

# IMPLEMENTATION

## 5.1 BRIEF EXPLANATION OF IMPLEMENTATION

In this hypothetical scenario, the child safety robot is designed to educate children about good and bad touches while ensuring their safety. The robot uses a combination of touch sensors and a flex sensor to detect physical interactions. It also incorporates facial recognition technology to personalize interactions with children, addressing them by name and providing tailored feedback.

When a child interacts with the robot, it engages in a practice session to help the child recognize and differentiate between good and bad touches. The robot guides the child through various scenarios, prompting them to identify the nature of each touch. If the child correctly identifies a good touch, the robot praises them. However, if the touch is identified as bad, the robot provides guidance on how to respond and sends an alert to the child's parents using the twilio messaging system.

The robot's ability to recognize faces allows it to adapt its interactions based on the child's identity. If the robot detects an unknown face, it prompts the child to practice touch recognition without personalized feedback. This ensures that the safety features are still effective even when the child's identity is not recognized.

Overall, the child safety robot provides a proactive and personalized approach to educating children about safe touches, empowering them to identify and respond appropriately to different types of physical interactions while also keeping parents informed about potential safety concerns.

## 5.2 SOURCE CODE

**Child Safety Robot**

```
import subprocess
import RPi.GPIO as GPIO
import time
import pyttsx3
from twilio.rest import Client
import pickle
from phone_numbers import parent_phone_numbers, unknown_parent_phone
```

```
import smbus

class ChildSafetyRobot:
        def __init__(self):
            self.engine = pyttsx3.init()
            self.client=Client("AC8322e7390ddcff879f38bbe6b2557aa3",
            "2bdfa5af2ce7ea18b26fc917d40fcc4e")
            self.touch_pins = [17, 27, 23, 24]
            GPIO.setmode(GPIO.BCM)
            GPIO.setup(self.touch_pins[0], GPIO.IN)
            GPIO.setup(self.touch_pins[1], GPIO.IN)
            GPIO.setup(self.touch_pins[2], GPIO.IN)
            GPIO.setup(self.touch_pins[3], GPIO.IN)
            self.flex_threshold = 245  # Adjust as needed
            self.i2c_address=0x48
            self.i2c_bus=smbus.SMBus(1)
        def speak(self, text, emotion="neutral"):
            self.engine.say(text)
            self.engine.runAndWait()
        def wait_for_touch(self):
            flex_above_threshold=False
            start_time=time.time()
            print("Waiting for a touch on any sensor...")
            while True:
                flex_value=self.read_flex_sensor()
        if GPIO.input(self.touch_pins[0]) == GPIO.HIGH or flex_value>self.flex_threshold or
        GPIO.input(self.touch_pins[1]) == GPIO.HIGH or GPIO.input(self.touch_pins[2]) or
        GPIO.input(self.touch_pins[3])== GPIO.HIGH:
                break
                time.sleep(0.1)
        if GPIO.input(self.touch_pins[0]) or GPIO.input(self.touch_pins[1])== GPIO.HIGH:
                return "good_touch"
        elif flex_value>self.flex_threshold:
```

```
                if not flex_above_threshold:
                start_time=time.time()
                 flex_above_threshold=True
        else:
                flex_above_threshold=False
        if flex_above_threshold and time.time()-start_time>=2:
                print("Someone holding it this long is a bad touch")
                return "bad_touch"
    elif GPIO.input(self.touch_pins[2]) or GPIO.input(self.touch_pins[3])== GPIO.HIGH:
                return "bad_touch"
 def read_flex_sensor(self):
        flex_value = smbus.SMBus(1).read_byte_data(0x48,0)
         print(flex_value)
         return flex_value
```

**Face Recognition and Touch Practice**

```
def recognize_child_face(self):
   process = subprocess.Popen(["python", "face_req.py"], stdout=subprocess.PIPE,
   stderr=subprocess.PIPE)
   stdout, stderr = process.communicate()
   output = stdout.decode("utf-8")
    recognized_face_name = output.strip()
    return recognized_face_name
def practice_touch_recognition(self):
    print("Let's practice recognizing good and bad touches.")
    self.speak("Let's practice recognizing good and bad touches.")
    print("I will ask you about different touches, and you can tell me if they are good or bad.")
    self.speak("I will ask you about different touches, and you can tell me if they are good
    or  bad.")
    print()
    print()
    print("Trying to recognize the face.....................")
    print()
   child_name = self.recognize_child_face()
```

```
    if child_name != "Unknown":
                print(f"Welcome, {child_name}! Let's practice touch detection.")
                self.speak(f"Welcome, {child_name}! Let's practice touch detection.")
                touch_type = self.wait_for_touch()
                if touch_type == "good_touch":
                    self.speak(f"That's right {child_name}, Good job! It is a good touch")
                    print(f"That's right! {child_name} Good job! It is a good touch")
                    time.sleep(2)
                    print("Let's try again")
                    self.practice_touch_recognition2(child_name)
                elif touch_type == "bad_touch":
                    self.speak(f"That's not acceptable, {child_name}. You experienced a bad touch. I'm here to help.")
                    print(f"That's not acceptable, {child_name}. You experienced a bad touch. I'm here to help.")
                    self.send_alert_sms(child_name)
                else:
                    print("Unknown face detected.")
                    self.parent_phone_numbers["Unknown"] = self.unknown_parent_phone
                    touch_type = self.wait_for_touch()
                if touch_type == "good_touch":
                    print("Good touch detected from an unknown person.")
                elif touch_type == "bad_touch":
                    print("Bad touch detected from an unknown person.")
                    self.send_alert_sms("Unknown")
                else:
                    print("Unknown touch detected.")
def practice_touch_recognition2(self, child_name):
            touch_type = self.wait_for_touch()
            flex_value = self.read_flex_sensor()
            if touch_type == "good_touch":
                self.speak(f"That's right {child_name}, Good job! It is a good touch")
                print(f"That's right! {child_name} Good job! It is a good touch")
```

```
            time.sleep(2)
            print("Let's try again")
            self.practice_touch_recognition2(child_name)
        elif touch_type == "bad_touch" or flex_value > self.flex_threshold:
            self.speak(f"That's not acceptable, {child_name}. You experienced a bad touch. I'm here to help.")
            print(f"That's not acceptable, {child_name}. You experienced a bad touch. I'm here to help.")
            self.send_alert_sms(child_name)
        else:
            print("Unknown touch detected.")
    def greet(self):
        print("Hello! I'm your Child Safety Robot. Let's learn about good touch and bad touch.")
        self.speak("Hello! I'm your Child Safety Robot. Let's learn about good touch and bad touch.")
    def introduce_lesson(self):
        print("In this lesson, we'll learn about different types of touches.")
        self.speak("In this lesson, we'll learn about different types of touches.")
        print("Good touch can be friendly, like a high-five. Bad touch can make you uncomfortable.")
        self.speak("Good touch can be friendly, like a high-five. Bad touch can make you uncomfortable.")
    def explain_good_touch(self):
        print("Good touch feels nice, like a hug from someone you trust.")
        self.speak("Good touch feels nice, like a hug from someone you trust.")
        print("Can you think of other examples of good touch?")
        self.speak("Can you think of other examples of good touch?")
    def explain_bad_touch(self):
        print("Bad touch is not okay. It can be someone touching your private parts.")
        self.speak("Bad touch is not okay. It can be someone touching your private parts.")
        print("Remember, you can say 'no' to bad touch and tell a grown-up.")
        self.speak("Remember, you can say 'no' to bad touch and tell a grown-up.")
    def send_alert_sms(self, child_name):
```

```
            if child_name in parent_phone_numbers:
                parent_phone = parent_phone_numbers[child_name]
                twilio = "+12138163726"
                message = self.client.messages.create(
                from_=twilio,
      body=f"⚠Your child {child_name} might have experienced an unsafe touch✕. Please check in with them.",
                to=parent_phone
          )
                print("Alert SMS sent to Parent phone number")
            else:
                self.send_alert_sms("Roopesh")
                print("Alert sent to the default number")

          def interact(self):
              self.practice_touch_recognition()
if __name__ == "__main__":
              robot = ChildSafetyRobot()
              robot.interact()
```

**Data Collection**

```
import cv2
from picamera import PiCamera
from picamera.array import PiRGBArray
name = 'name' #replace with your name
cam = PiCamera()
cam.resolution = (512, 304)
cam.framerate = 10
rawCapture = PiRGBArray(cam, size=(512, 304))
img_counter = 0
while True:
    for frame in cam.capture_continuous(rawCapture, format="bgr", use_video_port=True):
        image = frame.array
        cv2.imshow("Press Space to take a photo", image)
```

```
        rawCapture.truncate(0)
        k = cv2.waitKey(1)
        rawCapture.truncate(0)
        if k%256 == 27:
            break
        elif k%256 == 32:
            img_name = "dataset/"+ name +"/image_{}.jpg".format(img_counter)
cv2.imwrite(img_name, image)
            print("{} written!".format(img_name))
            img_counter += 1
        if k%256 == 27:
            print("Escape hit, closing...")
          break
cv2.destroyAllWindows()
```

**Training**

```
from imutils import paths
import face_recognition
import pickle
import cv2
import os
print("[INFO] start processing faces...")
imagePaths = list(paths.list_images("dataset"))
knownEncodings = []
knownNames = []
for (i, imagePath) in enumerate(imagePaths):
    print("[INFO] processing image {}/{}".format(i + 1, len(imagePaths)))
            name = imagePath.split(os.path.sep)[-2]
            image = cv2.imread(imagePath)
            rgb = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
            boxes = face_recognition.face_locations(rgb, model="hog")
            encodings = face_recognition.face_encodings(rgb, boxes)
for encoding in encodings:
    knownEncodings.append(encoding)
```

```
            knownNames.append(name)
    print("[INFO] serializing encodings...")
    data = {"encodings": knownEncodings, "names": knownNames}
    f = open("encodings.pickle", "wb")
    f.write(pickle.dumps(data))
    f.close()
```

**Face Recognition**

```
from imutils.video import VideoStream
from imutils.video import FPS
import face_recognition
import imutils
import pickle
import time
import cv2
def recognize_face():
    encodingsP = "encodings.pickle"
    data = pickle.loads(open(encodingsP, "rb").read())
    vs = VideoStream(usePiCamera=True).start()
    time.sleep(2.0)
    fps = FPS().start()
    recognized_face_name = "Unknown"
    while True:
        frame = vs.read()
        frame = imutils.resize(frame, width=500)
        boxes = face_recognition.face_locations(frame)
        encodings = face_recognition.face_encodings(frame, boxes)
        for encoding in encodings:
            matches = face_recognition.compare_faces(data["encodings"], encoding)
            name = "Unknown"  # if face is not recognized, then print Unknown
            if True in matches:
                matchedIdxs = [i for (i, b) in enumerate(matches) if b]
                counts = {}
                for i in matchedIdxs:
```

```
                name = data["names"][i]
                counts[name] = counts.get(name, 0) + 1
                name = max(counts, key=counts.get)
                recognized_face_name = name
               if recognized_face_name != "Unknown":
                        break
                 fps.update()
                fps.stop()
                cv2.destroyAllWindows()
                vs.stop()
                return recognized_face_name
if __name__ == "__main__":
    recognized_name = recognize_face()
    print(recognized_name)
```

# CHAPTER 6

# RESULTS

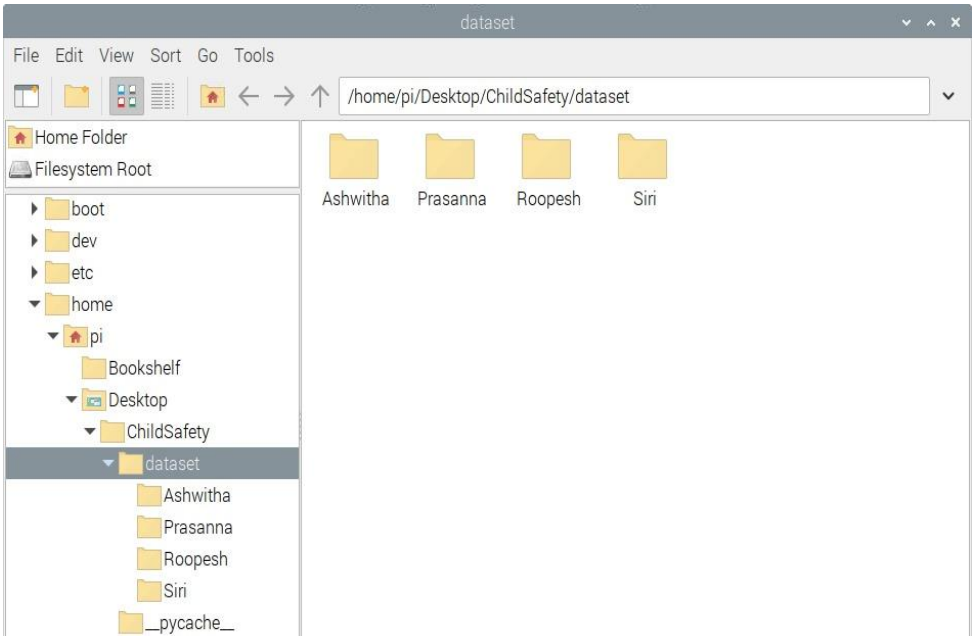


Figure 11: Dataset of child images for face recognition

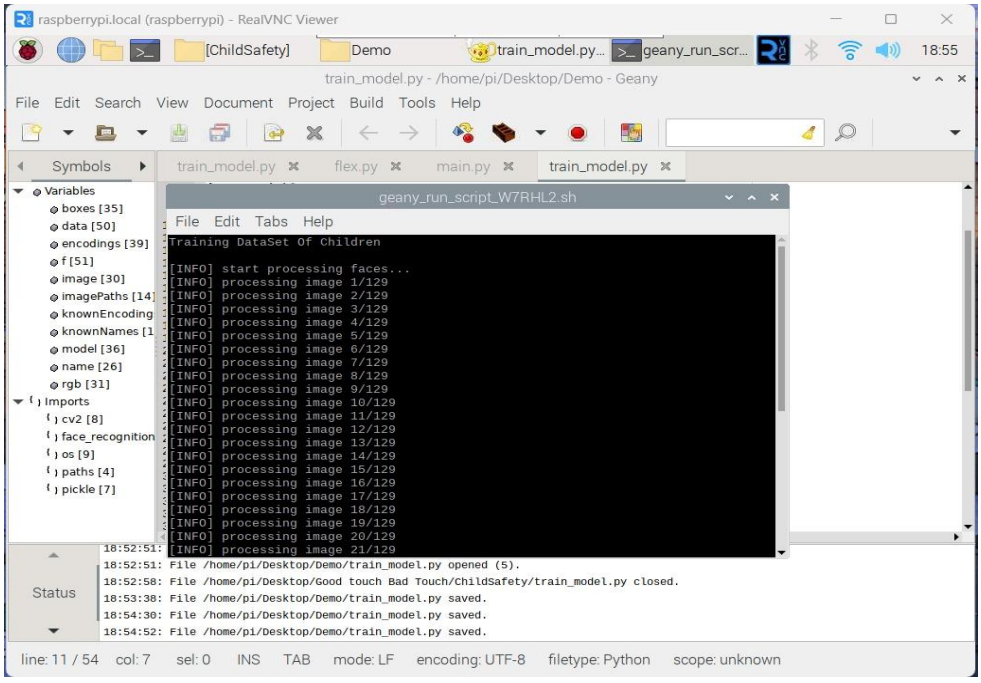


Figure 12: Training of datasets

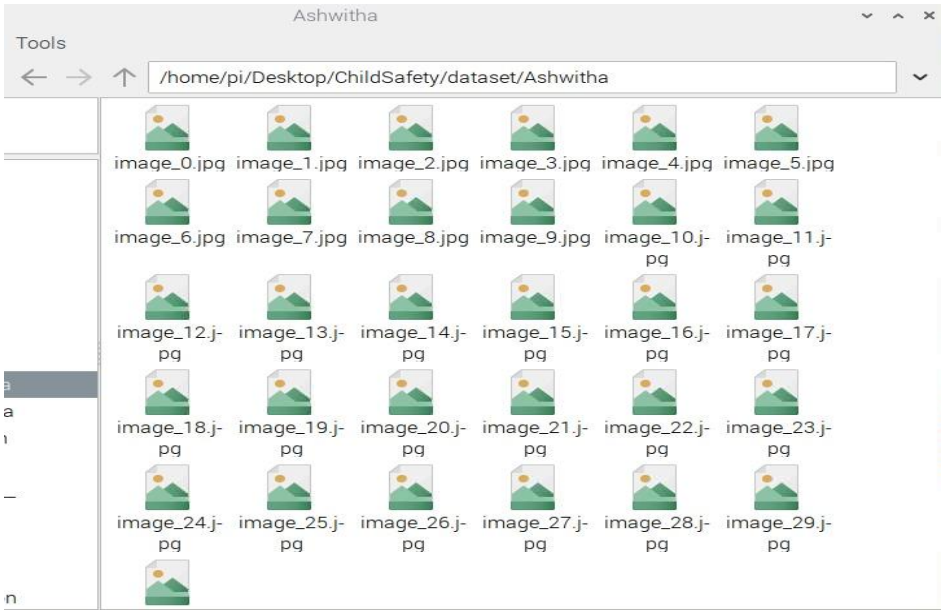


Figure 13: Dataset Image of child Ashwitha

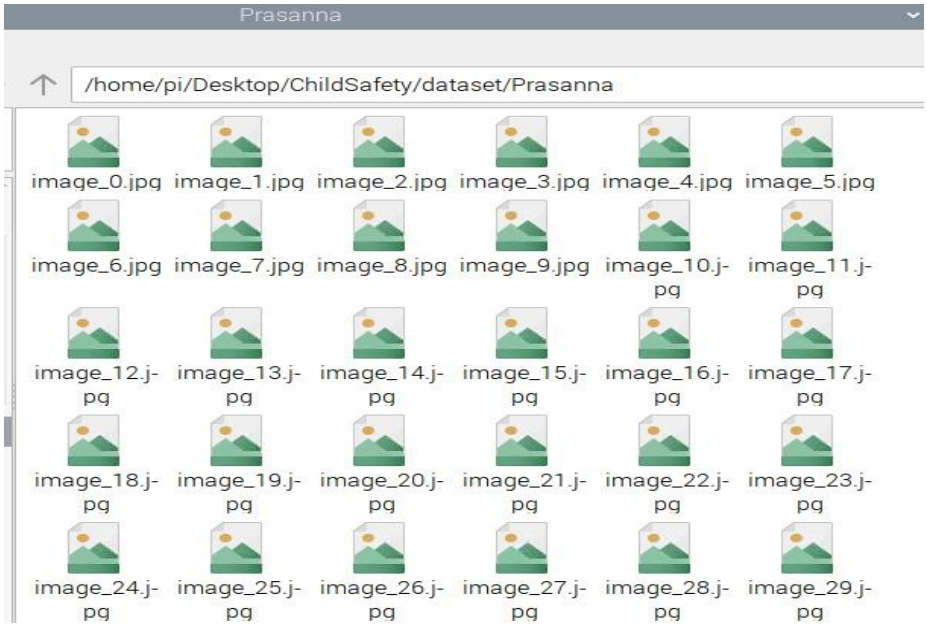


Figure 14: Dataset Image of child Prasanna

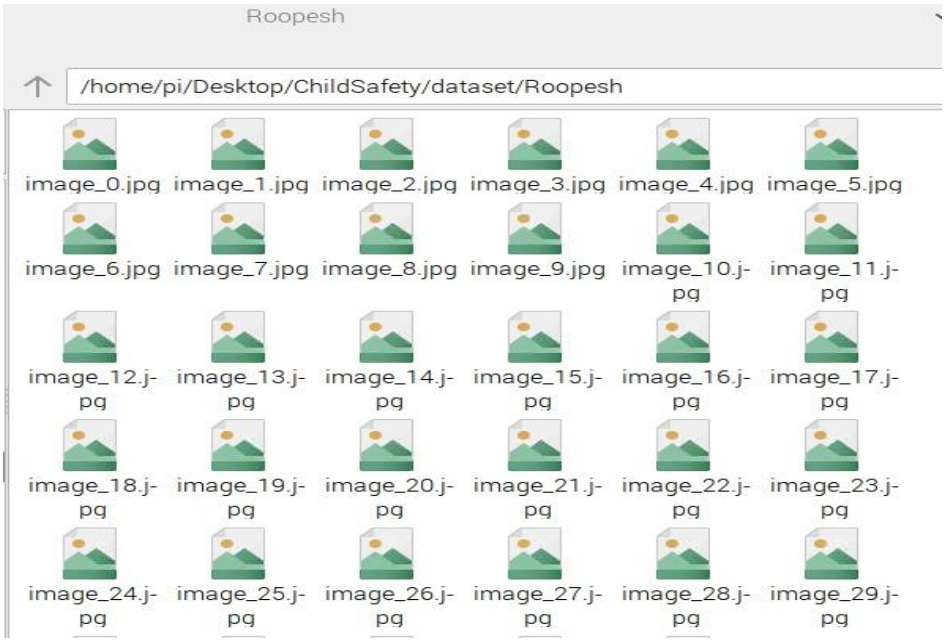


Figure 15: Dataset Image of child Roopesh

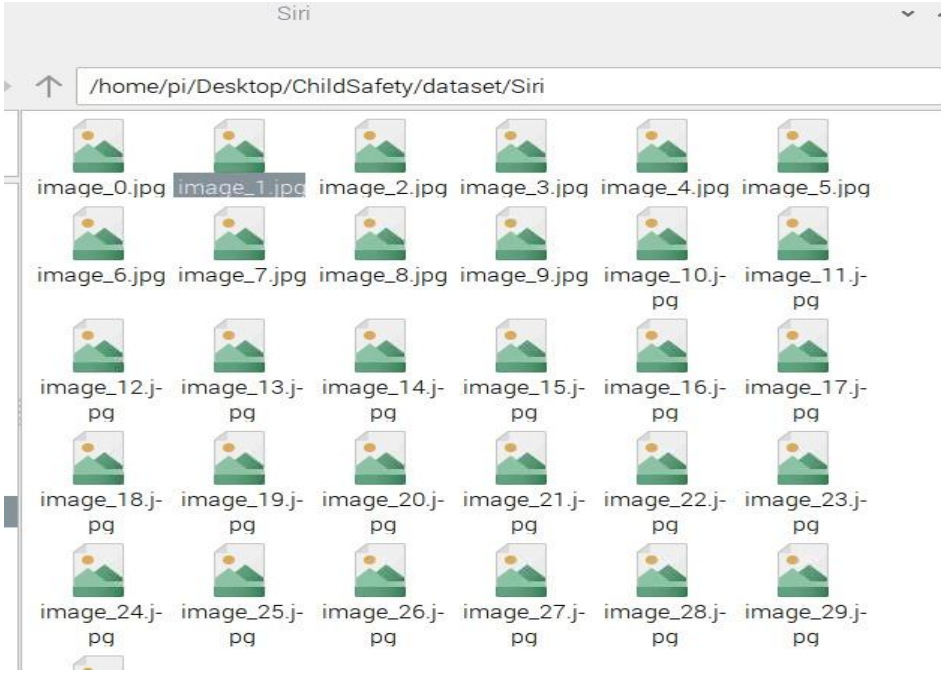


Figure 16: Dataset Image of child Siri

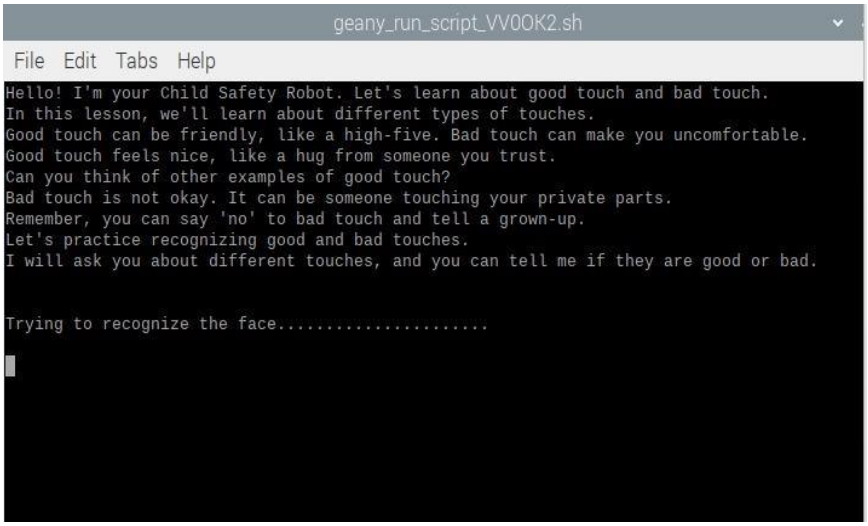


Figure 17: Face Recognizing

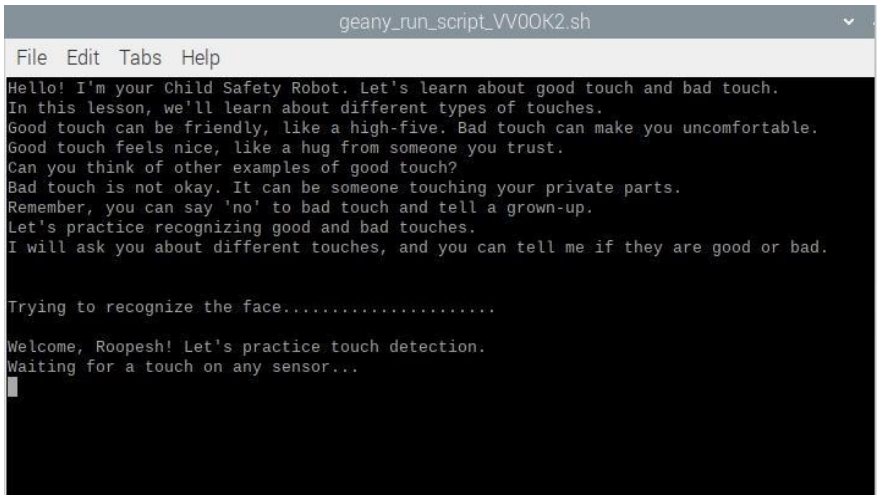


Figure 18: Face Recognized

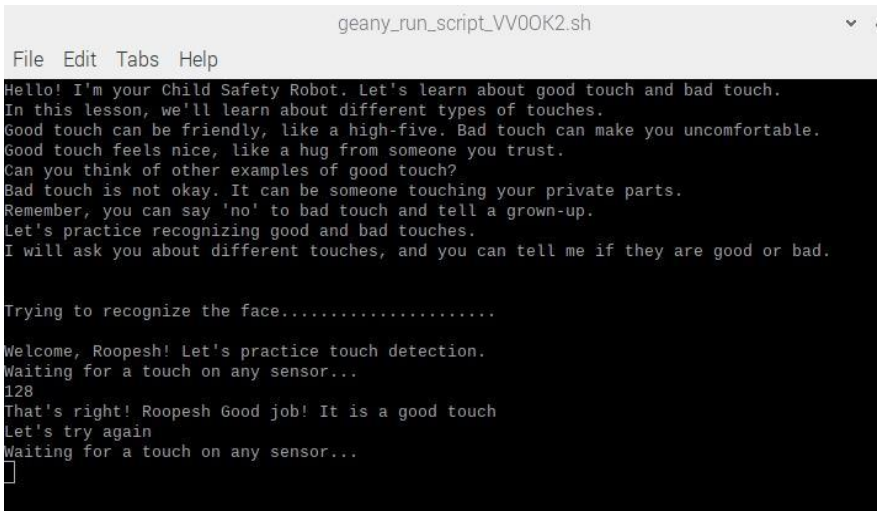


Figure 19: Interactive Learning

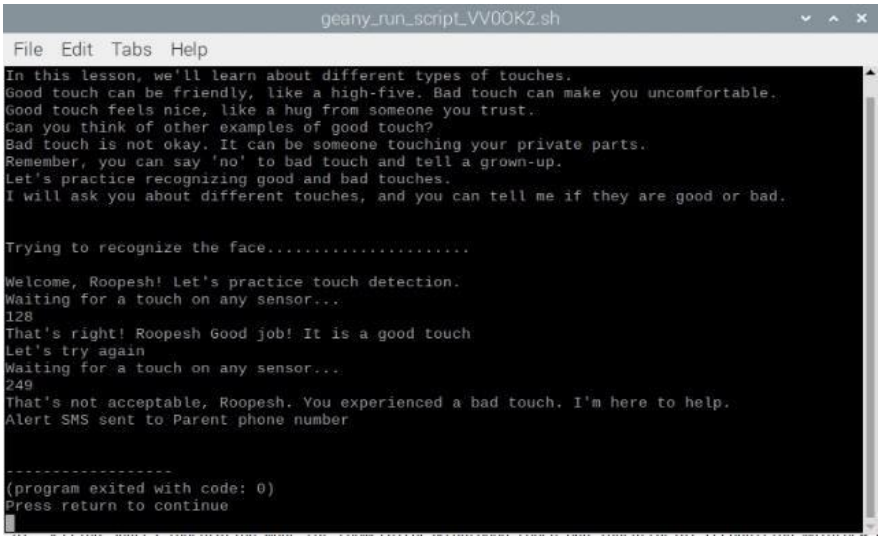


Figure 20: Feedback about Touch


Figure 21: Parental Notification

# CHAPTER 7

# CONCLUSION

Protecting kids from the constant risks of bullying and violence is essential in today's quickly changing social environment. Given the alarming number of victims who suffer abuse at the hands of people in their social circles, it is imperative that information on the differences between positive and harmful interactions be shared. We can protect children from potential harm by establishing open lines of communication with trusted people and creating a strong sense of personal boundaries. It is crucial to provide kids the freedom to express themselves and to understand their fundamental rights. Using cutting-edge technologies, like robotic interventions, to teach priceless lessons about distinguishing between proper and unsuitable behavior is one workable alternative. In addition to supporting schooling, these robots can act as watchful protectors, able to recognize and notify parents of possible threats. This will enhance safety precautions and foster a more secure atmosphere in which our kids can grow up.

## FUTURE ENHANCEMENTS AND DISCUSSIONS

The chances of AI and machine learning to detect patterns of bullying and violence can be greatly boosted by incorporating the algorithms in the system. This, in return, will allow them to address their clients' problems or avail of their services more precisely. Specific robots could have the capability of learning pupils at individual level as far as their unique needs and learning styles are concerned. This lead the educational content to be highly interactive and foster learning. Since robotics can reduce incidence of child abuse cases and sexual assaults, working with schools, community and organizations that target child protection to integrate the system can help to create a loving and safer environment for these children with the incorporation of other efforts.