Checklist (format and sample) for FYP 2 report

1. Equation (numbering)

predicted by the first division. A 2D depiction of the confidence that a specific body part could reside in any pixel is called a confidence map. Confidence Maps are seen in (1).

$$S = (S_1, S_{2\ldots}, S_J)\ where\ S_j \in R^{w*h}, j \in 1 \ldots\ldots J \qquad (1)$$

The following branch forecasts a further 38 Part Affinity Fields (PAFs) that represent the degree of relationship between parts. The position and orientation of various people's limbs in the image are encoded using a series of 2D vector fields

2. Table caption

Table 2.4 Comparing HRI Research for Autistic Kids (Othman & Mohsin, 2018)

Robots	**Collaboration with the robots**
NAO	This robot supported and encouraged social engagement with autistic kids.
PROBO	Instead of serving as a social mediator, PROBO provided autistic youngsters with social participation that was comparable to that of a human.
KEEPON	It is a sophisticated robot design intended to improve kids' social interactions.
PLEO	PLEO is intended to assist autistic students in improving their verbalization and interaction more than computer games or other people, especially as they

3. Figure caption

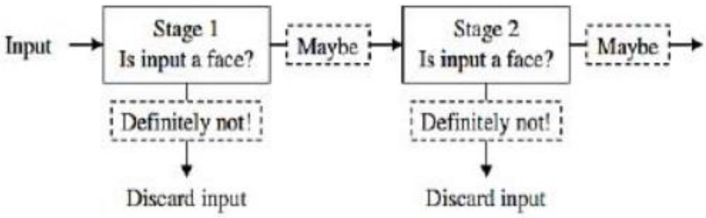

Figure 2.5 Cascade classifier (Biswas et al., 2018)

4. Summary for Chap 2

2.7 SUMMARY

To summarise all the articles reviewed, mobile robots' fabrication is not simple work, and it becomes more complex as the tasks for the robot increase, including the selection of sensors to be utilised by the robot. Every positioning method, coordinating, and path planning has its optimal sensors meant for the desired task.

For positioning, IMU sensors seem to be the best choice because, from the experiments, it has a small percentage error for indoor usage. For coordination, the combination of an encoder, vision sensor, and distance sensor that uses ToF technology like LiDAR can be utilised to map the environment that the robot will go through. ToF sensors are inexpensive, small-sized, simple to realise and can increase their accuracy of measurement over time (Amad-ud-Din et al., 2009). ToF sensors with depth-sensing features are believed to be the pillar of a new electronic perception technology, providing all electronic gadgets with the capability to get in touch with the world around them (Gokturk et al., 2004). Finally, for path planning, the latest algorithms are the most suitable for autonomous robots. The benefit of the algorithms has been demonstrated in Table 3 earlier. Even though they are great, the cost and complexity of the algorithm are too much to be utilised by the competition. Hence, improved traditional path planning algorithms will be used as they are much simpler to be implemented.

5. Objective

1.4 OBJECTIVES

The objectives of this research are:

1. To investigate available gesture recognition system suitable for healthcare.
2. To identify the best gesture recognition system through performance analysis for imitation application.
3. To integrate and evaluate the automated posture recognition system embedded in the social robot.

6. Problem statement

1.2 PROBLEM STATEMENT

Currently, there is a wide range of gesture recognition algorithms, libraries, and tools available online, such as on GitHub, that have been developed by researchers and programmers. However, integrating these algorithms with social robots in the healthcare sector presents a significant challenge. The code available on platforms like GitHub is often generic and may not be suitable for implementation in this specific project. Additionally, the accuracy of different algorithms and libraries can be low and processing time can be long. Furthermore, ensuring efficient and robust functioning of both the gesture recognition system and social robot interfaces during therapy delivery poses an additional challenge.

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10. Abstract (components)

ABSTRACT

Ideally, a smart mobile robot should be equipped with precise and reliable movements to ensure that it can move through the dedicated paths while completing all the given tasks fastly, accurately, and smoothly.

PROB. STATEMENT

However, mobile robots have a constraint in terms of manoeuvrability as the robots normally will make incorrect movements with a huge margin of error.

AIM

Therefore, the project focuses on developing a mobile robot that can position, coordinate, and plan its path toward desired positions. By taking the IIUM Roboteam's mobile robot, which is usually used in ROBOCON Malaysia competitions, as a platform, the robot is studied thoroughly,

METHODOLOGY

starting from its base structure. Two different bases are tested to carry varying loads to make sure that the bases are robust. Also, the proposed sensor for positioning the robot is analysed to ensure the accuracy of the robot's movements. Additionally, several path planning algorithms have been examined in MATLAB to check their compatibility with the robot.

RESULTS

As results, the 4-tyred base is twice stronger against Von Mises Stress and thrice more durable to displacement when compared to the 3-tyred base once a load of 25kg is evenly applied on the bases. The IMU, which is MPU 6050 tested and simulated, turned out well, with an error close to zero percent. Finally, the Dijkstra path planning algorithm is obtained to be the optimal algorithm to be implemented for the focused mobile robot of this project. Simulations show that the algorithm provides the shortest path with the fastest completion time compared to RRT*.

FUTURE WORK

Future projects might look into the implementation of the suggested 4-tyred system as the base, MPU 6050 for positioning, and the Dijkstra algorithm as the path planner on a real robot for analysing the performance of the systems in terms of speed, stability, and reliability.

11. Declaration of work

DECLARATION

I hereby declare that the project entitled "Positioning, Coordinating, and Path Planning of Mobile Robots" is the result of my studies, excepts where otherwise stated, submitted to the International Islamic University of Malaysia under the supervision of Dr. Aimi Shazwani Binti Ghazali, Dr. Khairul Affendy Bin Md Nor, and Dr. Mohd Asyraf Bin Mohd Razib, Department of Mechatronics Engineering. I also declare that it has not been previously or concurrently submitted for any other degrees at IIUM or other institutions.

....

Muhammad Hafiz Bin Rushdi
Date: 14 July 2022

12. Approval page

APPROVAL

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as Final Year Project report as partial fulfillment for a degree of Bachelor of Engineering (Mechatronics) Honors.

DR. AIMI SHAZWANI GHAZALI
Assistant Professor
Department of Mechatronics Engineering
Kulliyyah of Engineering
International Islamic University Malaysia

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Dr. Aimi Shazwani Binti Ghazali
Project Supervisor

13. Front page

POSITIONING, COORDINATING AND PATH PLANNING OF MOBILE ROBOTS

MUHAMMAD HAFIZ BIN RUSHDI

1818713

DEPARTMENT OF MECHATRONIC ENGINEERING

KULLIYAH OF ENGINEERING

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

JUNE 2022