

Design Project

Social Robot

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Objective

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The objective of the project is to make a social robot which can detect and describe the objects which it can see, as an experiment with Machine Learning, Image Processing, Android and Networking.

Abstract

Social Robots are an inevitable part of the digital era. This project aims at building a social robot by integrating with an android application and a server.

Introduction

- Social robots are autonomous robots that interacts and communicates with humans.
- Some of them are used for interacting with humans for utilitarian purposes and others are designed to trigger human emotions.
- In contrast to chatbots or avatars, social robots are physically embodied.

Existing Robots

- Kismet
 - It's a robot made at MIT as an experiment in affective computing.
 - Kismet simulates emotions through various facial expressions, vocalizations and movement.
- Joe Robot
 - It's a robot made in research of Anthropomorphism.
 - It develops intelligence during the meaningful social interactions between AI and people.
- Furby
 - It's a electronic robotic toy created by Tiger Electronics
 - Furby initially speaks in furbish and then later on learns the language that the owner speaks by itself.

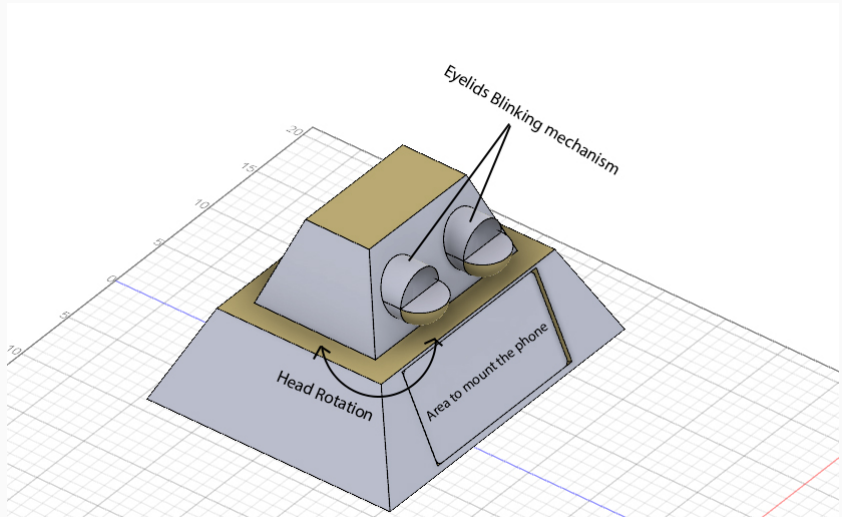
Proposed Work

Proposed Work

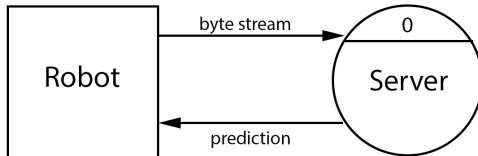
- The proposed work is to create a social robot which can detect and describe the objects which it sees.
- The physical body of the robot will have human like movement capabilities.
- Image Classification using SVM of the live camera stream.
- An Http Server is used to detect and identify objects that the robot sees.
- An android application that acts as an interface between the robot and server.

Design

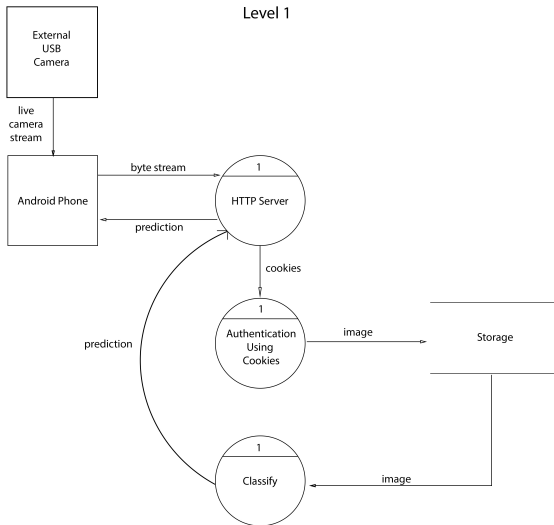
Model of Robot



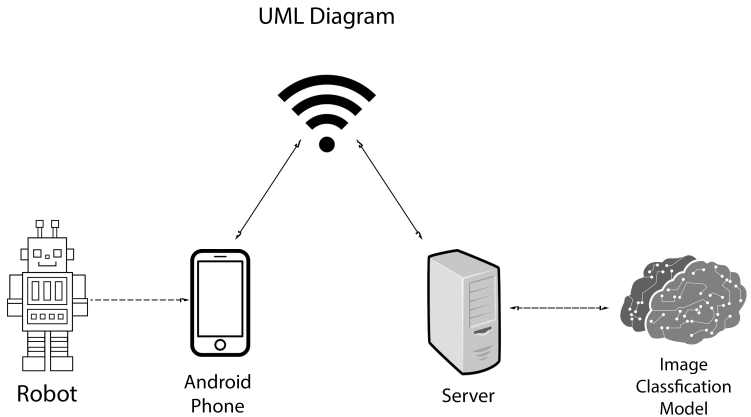
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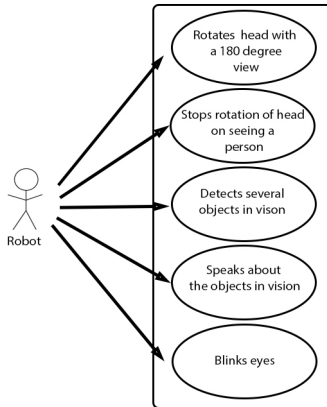
Data Flow



UML Deployment Diagram



Use Case Diagram



Completed Tasks

Task 1

- Create an android application and render the camera frames on top of the OpenGL surface.

Task 2

- Classify Documents using SVM classifier from sklearn library.
- Predict the accuracy of classification.

Task 3

- Create a server.
- Create an android app to capture images and send it to the server.
- Convert the image to grayscale and sent it back to the app.

- Image classification using SVM Classifier.

Task 5

- Classify images sent from the android app in the server.
- Retrieve classification from server and display in app.

Task 6

- Send live feed from android app to the server
- Detect objects on the go in the server and send back the predictions

- Using Grid Search Tuning technique to evaluate the correct combinations of classifier parameters for improved accuracy in classification.
- Scaling in-order to make the feature range between 0 and 1.
- Replacing previous feature extraction methods with HOG.

Task 8

- Fetch live stream from usb camera to the android app.
- The live classification on that data.

Results

Results

- The outcome of the project is a social robot which can identify the objects seen in its vision.
- The robot, in its physical structure, has a 180 degree view made possible by its head movements.
- The robot performs a specific function of object classification.
- The live feed it retrieves from the usb camera attached to its eyes are fed to an android application on the phone.
- The app send the images to the server where it undergoes a number of processes as specified in the explanation of the project.
- Once the image classification is done, the robot speaks out what it sees.

Conclusion

Conclusion

- A social robot is an autonomous robot that interacts and communicates with humans or other autonomous physical agents by following social behaviors and rules attached to its role.
- This project successfully created a social robot, incorporated with human features such as, movement of head, closing of eyelids and speaking, and can identify and speak out about the objects seen through its vision, by making use of useful and popular computing domains such as Android, Machine learning, Image processing and Servers.