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Smart Navigation Robot Using Raspberry Pi

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ABSTRACT -While many researchers are investigating human-robot social interaction, one area that remains relatively unexplored is that of continued long-term interaction. So we implemented a robot called NAVBOT. Computers are getting to be indispensable nowadays. Most of us, however, do not think they are friendly enough. Intelligent robots will make a chance for us to use a computer in our daily life. The robot we have designed, named NAVBOT remains stationary inside a small booth near the main entrance Once gets the signal of visitor in the office. NavBot can interact with the visitors and welcome them and make them to sit. NavBot can ask the visitor the purpose of the visit and intimate the message to the concern person and waits for the response from the concern person.These robots are expected to interact with human in daily-lives or office-spaces. Since it is said that non-verbal medium are important for realization of smooth communication, most of these robots try to share information with human through not only verbal communication.

KEYWORDS:Robotic Vehicle, Object Detection, Face recognization, Mobile application, Python Programming, java programming, c programming.

I. INTRODUCTION

These days, research and development of multiple interaction-oriented robots have been frequently observed. These robots are expected to interact with human in daily-lives or office-spaces. Since it is said that non-verbal medium are important for realization of smooth communication, most of these robots try to share information with human through not only verbal communication but also non-verbal communication such as a glance, a nod, and gestures. However, these robots are immediately recognized as robots because of mechanical appearance. On the other hand a few robots that have human-like appearance are developed, and they are called android-robot. Kobayashi tried to realize natural facial expressions because facial expressions are said to be playing the most important role in face-to-face communication.

Oh also make realistic face robot with special skin material called “Frubber”. Ishiguro developed whole body type android robots by ordering to a company. They tried to generate natural behaviors and motions of the robot. In addition, they try to evaluate humanity of android robots in cognitive science perspective. The greatest asset of android robots is that they give us a strong feeling of presence as if we communicate with real human. Therefore it seems that android robots bring human-robot communication close to human-human communication, while robots with mechanical appearance lack the ability to express human-like behaviors in particularly non-verbal communication.

Humanoid robots are increasingly popular in front desk(information desk and reception) applications. Automatic systems capable of booking hotel rooms or interactive systems designed to present information on a given topic, which resemble a natural human interaction, communication and construction, are especially attractive for the users. Robots seen to gain trust and confidence – research indicates that people tend to believe robot commands at least on par with the instructions and information obtained from people. The popular Pepper robot from SoftBank Robotics, takes care of traffic management in a hospital in Belgium, it is working as a hotel receptionist in a Japanese hotel Hannna, it is also working as an information point in the We agree company in Poland. However, the built-in systems used for collecting information from the environment do not always seem to fulfill their role reliably outside laboratory conditions. This applies in particular to complex and specific audio and video processing tasks. Parameters of built-in devices, their location on the robot and interference from the environment effectively deteriorate the quality of signals obtained.

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II. RELATED WORK

Title :The Receptionist

Author: Patrick Holthaus& Sven Wachsmuth,In this demonstration, a humanoid robot interacts with an interlocutor through speech and gestures in order to give directions on a map. The robot is placed behind a receptionist desk with a map of the university campus (or floor plan) waiting for potential interlocutors. Visitors can approach the robot and ask it in which direction to find places certain.
Title: Consumer Evaluation of Hotel Service Robots
Author: Iis P. Tussyadiah and Sangwon, Park In light of the trend in integrating artificial intelligence and robotics into tourism and hospitality operations, it is important to understand consumer responses to hotel service robots.
Title: Designing Robots for Long-Term Social Interaction
Author: Rachel Gockley, Allison Bruce, Jodi Forlizzi, Marek Michalowski, Anne Mundell,
Stephanie Rosenthal, Brennan Sellner, Reid Simmons, Kevin Snipes, Alan C. Schultz and JueWan.Most social robot projects have worked to create systems that recognize and exhibit human emotions, or that aim solely to convey information.

II. PROPOSED ALGORITHM

A. *Design Considerations:*

- We have proposed a robotic receptionist which can do the job of a receptionist in an office.
- Robotic receptionist can sense the visitor or customer and welcomes them once they reach the office.
- The receptionist is fitted with a Raspberry Pi and HD camera and we have used artificial intelligence into it. The receptionist can make the guest sit in the reception and interact with them.
- The receptionist welcome the guest and ask the guest the purpose of the visit and based on that it sends a request to the concern person.
- The requested person gets the notification into the Android phone and can send the instruction to the receptionist. The receptionist convey the message to the guest.
- The guest can follow the receptionist to reach the concern person. The receptionist can capture the image of each and every guest and welcomes automatically from the next visit.

Advantages:

- Cost efficient
- Updated technologies
- Easy to manage the guest's records
- Keep a record of the conversation with the guest

Algorithm:

- Firstly the input image will be taken, the cropping of the face and the face discovery calculations are will be done using the Viola-Jones algorithm.
- The Viola-Jones calculation is used for pattern matching the face features related to the image presentin the database records.
- Then features of face will be extracted using Gabor filter bank, GLCM (Grey Level Co-Occurrence Matrix) and HOG (Histogram of Oriented Gradients)
- HOG image descriptors and Linear Support Vector Machine (LSVM) are used to train. Certain steps are to be followed in HOG. They are:
  - Extracting HOG descriptors from the positive samples of trained images.
  - Extracting HOG descriptors from the negative samples that don't contain any objects.
  - Training LSVM on the samples.
  - Computing HOG descriptors and applying classifiers on samples which are called as hard negative mining.
  - Collecting the false negative samples which are found from the hard negative mining stage and sort them.
  . Testing with dataset.

Finally face recognition is done by using Euclidean distance method.

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III. PSEUDO CODE

```
#.....Automatic Webcam/rspb to capture image.....#
import os
import time
import cv2

cap = cv2.VideoCapture(0)
i=0
while(True):
   ret, frame = cap.read()
   cv2.imshow("imshow",frame)
i+=1
time.sleep(4)
   cv2.imwrite('Test/a.jpg', frame)
   f=open('readdata.txt','w')
f.write('read')
f.close()
   face = "capture image"
print("camera is start:",face )

   if cv2.waitKey(30) & 0xFF == ord('q'):
      break

cap.release()
cv2.destroyAllWindows()
```

IV. SIMULATION RESULTS

TWO APPS ARE THERE TO COMMUNICATE BETWEEN EMPLOYEE AND GUEST USING ROBOT.

1. EMPLOYEE APP

Employee app is used by the respective employees in an organization, which helps the employees to give the instruction to the robot by which robot can act accordingly.
After guest enters the details in the robot app the app will sends the data to employee app that is installed in employees using that app employees can give the instruction to the robot.

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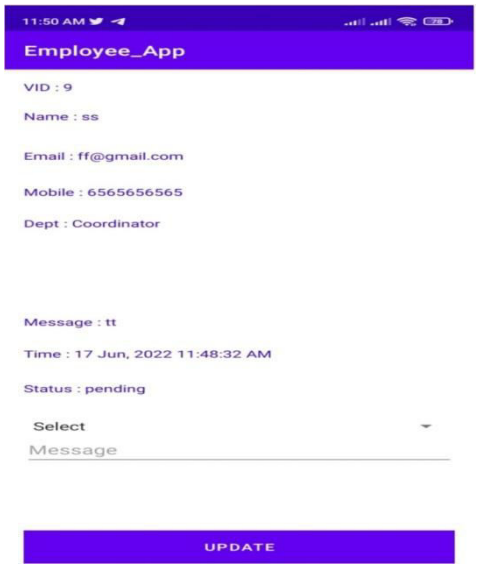
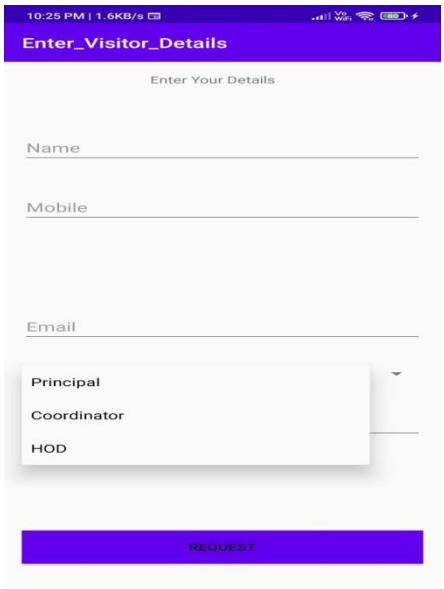


2.ROBOT APP

Robot app is used by guest, this app ask for required details from the guest and ask the purpose of the visit finally sends it to respective employees for permission.

Firstly robot will welcome the guest after the robot will ask to fill the details using robot app and it sends the data to employee app.



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V. CONCLUSION AND FUTURE WORK

smart cities and smart tourism are one of the booming research areas, several object detection models were developed to efficiently detect objects with high accuracy, in this study an EfficientDet-d2 was proposed to detect statues around Near East University, the trained model was used to develop a light mobile application. The performance of the model shows that it is capable of performing the required task. In future work, more networks will be considered for better performance in the detection. So far the limitations of the study are the requirement of training in case of additional statue.

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5. Ana Cristina M. J. Aleixo,“Receptionist Robot using Navigation and Image Processing”
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