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Interactive Humanoid Robot

Dr. Wilferd John Vaz[1], Professor
Electronics & Communication Engineering Department
Nagarjuna College of Engineering &Technology
Bengaluru, India

Sareddy Jaswanth Reddy [2], Student
Electronics & Communication Engineering Department
Nagarjuna College of Engineering &Technology
Bengaluru, India

Sushmitha KR[3], Student
Electronics & Communication Engineering Department
Nagarjuna College of Engineering &Technology
Bengaluru, India

Swathi V[4], Student
Electronics & Communication Engineering Department
Nagarjuna College of Engineering &Technology
Bengaluru, India

Rashmi KR[5], Student
Electronics & Communication Engineering Department
Nagarjuna College of Engineering &Technology
Bengaluru, India

Abstract:- Humanoid Robots are built to mimic humans. The navigation problem of robot is solved by decomposing them into a series of small multi-objective optimization problems (MOPs) with corresponding local information, using multi-objective evolutionary algorithms (MOEAs).The humanoid robot can use its control function to stimulate more number of responses to its environment and uses a computing speed of milliseconds to anticipate and react to the movements done by workers at the workplace. For implementing the robotic control and computer vision functions a group of applications are developed in Raspberry Pi using Open CV modules. The Image processing and controlling is done by the processor Raspberry Pi . Various sensors will be embedded to fetch the data from the environment or the user. Required information is conveyed through LCD touchpad.

In this paper we are mainly concentrating on SLAM technology for tracking the position of robot and to prepare a map of surroundings, which helps in navigation of a person.

Keywords:- *Raspberry Pi Microcontroller, Touch Pad, Speaker, Accelerometer and Gyroscope Sensors.*

I. INTRODUCTION

A humanoid robot is a type of robot built to resemble human body. Humanoid robots generally have a head, two upper limbs, and two lower limbs, though some forms of humanoid robots has only part of the body, for example, from the upper part of waist. Few humanoids just have head designed to replicate human facial expressions through eyes and mouth.

Humanoid robots are developed to perform human based tasks such as personal assistance, through which they are able to assist the old and sick and dangerous or dirty works. Humanoids robots are also capable of doing some procedurally repetitive jobs, such as receptionists and automotive manufacturing company workers. Since they do the repetitive jobs humans can be replaced with the humanoid robots for better accuracy and performance.

II. RELATED WORK

First, Rainer Stiefelhagen, Hazım Kemal Ekenel, Christian F¨ugen, Petra Gieselmann, Hartwig Holzapfel, Florian Kraft, Kai Nickel, Michael Voit, and Alex Waibel[1]. (IEEE TRANSACTIONS ON ROBOTICS). They developed a natural multimodal humanoid robot interaction system which spontaneously recognizes the speech, process the multimodal dialogues and visual perception of the person who is using the robot. It includes localization of the robot, tracking and identification of the user, identification of sign gestures shown and also recognition of a user's head orientation. This project is defined as human to human robot interaction than human to robot interaction. Multiple algorithms were written for recognition of various different types of speech or dialogues and visual signs given by the user. They also presented several practical experiments on human-to-human robot interaction through speech and gestures.

In Shu-Yin Chiang*, Yi-Quan Jiang, Hsin-Tieh Yang, Chia-Chin WangandYu-ChenLee[2] Department of Information and Telecommunications Engineering, Ming Chuan University, Taiwan, IEEE. They developed a intelligent multifunctional humanoid robot to provide a companion and entertainment to the user, They used Kinect depth image as the visual platform to gain the information from the environment and to perform image processing. Next, the results from the image processing are considered in planning of robotic behavior. They used omnidirectional wheels, motors with high power, FPGA and ARM based tools as motion system, Lower body consists of four omnidirectional wheels in all the directions and upper body is human design. They used the information extracted from Kinect depth image stream to integrate the robot localization system and mapping of the real time environment and avoidance of obstacle. And also Kinect skeleton detection is

used to recognize facial expressions so the task of intelligent interaction is made easy.

In Takayuki Kanda, Member, IEEE, Dylan F. Glas, Masahiro Shiomi, and Norihiro Hagita[4], Senior Member,IEEE. They built this robot mainly for providing service at shopping malls, To provide proper service to the consumers, This paper describe the series of abstraction techniques for people's trajectories, and techniques to use the robot as social robot, which makes robot to proactively interact with the consumers and by providing sufficient information and also guiding visitors to reach their targets. They placed a ubiquitous sensor network with six laser range finders in a shopping mall. The system keep track og human positions and their behavior ,such as brisk walking, slow walking, wandering or standing, They collected human trajectories for a week, by applying cluster technology to the collected information about the place and people's typical global behavior . This information helps robot in targeting the people who needs service mainly who are slowly walking or stopping at the shop.

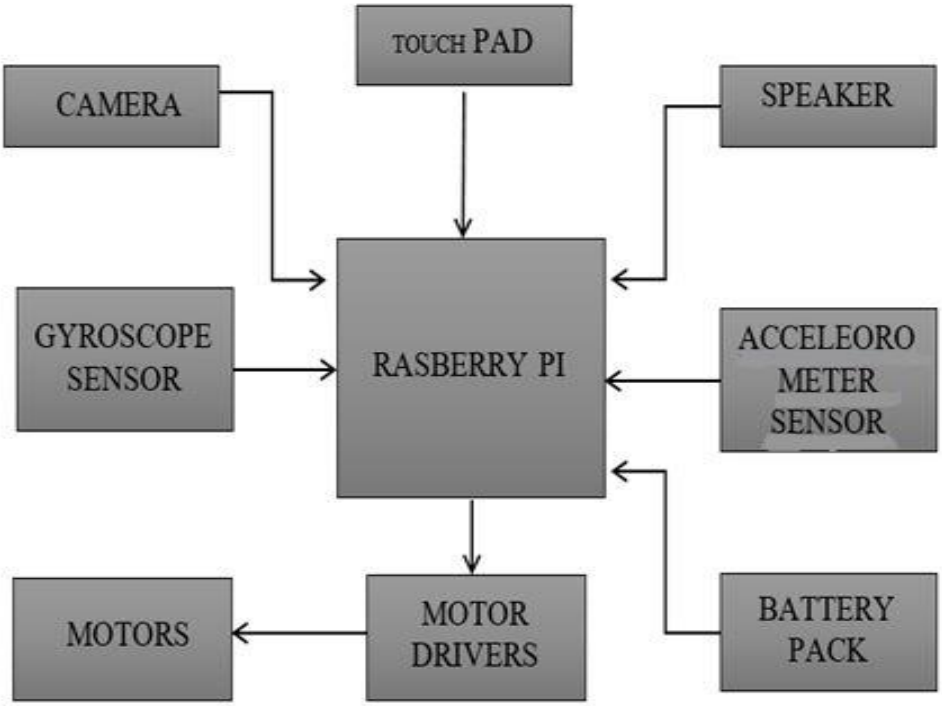

Fig 1:- System Architecture

Raspberry Pi processor for processing the images captured by the camera module. Gyroscope and accelerometer for controlling the attitude of the robot. Speaker and mic with audio driver setup to interact with the user. LCD touchpad is used to display the required visual information.

Initially the processor is set into active receiving mode and it will wake with commands and do the task and it sends the data to the microcontroller. In the microcontroller the received value is compared with all the values in the task codes. If the value matches with the s value in the code it will perform the task which was coded under that value subset.

It involves 4 steps

1. Transition of the value
2. Receiving the value by serial communication
3. Comparing the values with the pre-specified threshold value.
4. Executing task when there is a match.

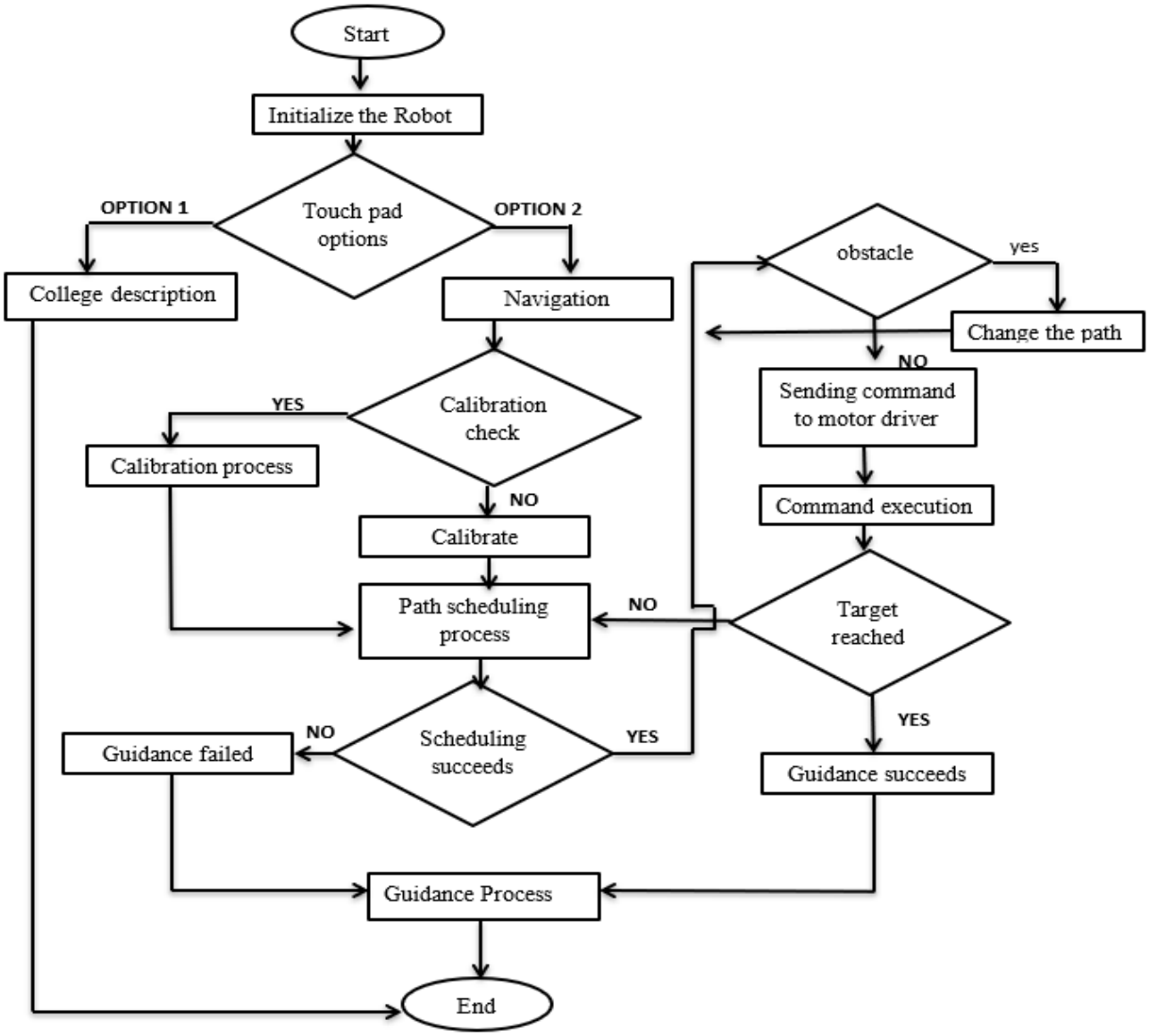

Fig 2:- Data flow diagram

III. WORKING

Initially, when the robot is turn on it manually asks the person to choose an option like navigate, introduce etc where these options are provided in the touch pad of the robot. As per the person's choice the robot will do its function. If a person chooses option1, it describes about the college and if a person uses chooses option2, the robot navigates the person, where this navigation works on SLAM technology. SLAM technology is the technique behind robot localization and mapping. The robot plots an imaginary line in an area and at the same time, it also figures out its own position located in the place. The process of SLAM technology uses a complex group of computations, algorithms and inputs from sensors to navigate around a previously unknown environment or to revise a map of a previously known environment. SLAM is just similar to that of a person trying to find his or her route around a new or an unknown place. First, the person looks for familiar markers or sign boards. Once the person finds or recognizes a familiar landmark, he or she can figure out where they are in relation to it. If the person does not finds or recognizes landmarks, he or she will be considered as lost. However, if the person observe the environment and landmarks, the person will recognize the place and begin to build an imaginary map of that place. The person may have to navigate or roam around this certain environment several times before becoming familiar with a previously unknown place. In a similar way, a humanoid robot built with the help of SLAM technology tries to build map of an unknown environment while figuring out where it is at. After building a map it tries to figure out its own position in which location it is by scanning the surroundings with the help of camera attached to it. After observing the surroundings it calibrates and comes to conclusion whether it is in right place or not. This humanoid robot also uses gyroscope and accelerometer sensor where these sensors maintains the orientation and angle of the robot in which it is moving. These sensors are connected to raspberry pi where it takes the input from the sensors and maintains the

position and angle of the robot. It also as an Ultrasonic sensor, where these sensors are used to avoid the obstacles during movement of the robot. And the motors are driven by motor drivers which drives the robot for movement of robot based on the input taken by various sensors connected to it. And for this autonomous robot battery pack is used as the robot is in movement with respect to its function and battery distortion for each component is controlled by raspberry pi board.

IV. CONCLUSION

The Proposed System "Interactive Humanoid Robot Removes" Is Mainly Built To Mimic Humans Who Does Repeated Task Such As Receptionists, Automotive Line Workers, Humanoid Robot Can Be Placed At Institutions And Working Areas To Guide And Navigate The Visitors And Also To Knowledge Them With Some Basic Information About The Respected Place.

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