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RAAHI: Route guiding Augmented reality based Autonomous Humanoid Instructor

Vaishnavi Nazare , P V Athira, Mansi Sawant, Srishti Singh and Gayatri Hegde
Department of Computer Engineering, Pillai College of Engineering, Navi Mumbai, India – 410206

ABSTRACT
RAAHI is an autonomous robot which guides the user to their desired destination with the help of voice commands. It provides assistance and information to the people in an innovative way and is used for indoor navigation. While navigating, the robot introduces the user to the surrounding using computer generated graphics and voice over to provide information about the organization. For this the visitor first needs to give the destination as input over the voice commands. The robot then plans the path of the tour based on the user input. The places (to be introduced) are associated with a tag and a unique ID. While navigating the robot detects such places using the detector and delivers information about it using the digital device display and the sound generator module. This will help the users by navigating them to their destination and will utilize the time of the tour effectively to promote the organization which in turn will enrich user experience. Hence, RAAHI can be a great help for the museums, industries, exhibition centers, schools, colleges and big organizations.
Keywords: assistance, autonomous, computer generated graphics, navigation**,** voice commands.

I. INTRODUCTION

There are no such tools which can be used for Indoor navigation so RAAHI provides a great help along with many additional benefits. It will not only give the instruction to be followed to reach the destination but can also take the user to its requested destination. While navigating it will introduce the surrounding environment to the new user using Augmented Reality. This will not only help the user to reach its destination but will make the user more aware of the ambience of the organization.

II. LITERATURE SURVEY

A. Line Following Robot [2] *:*The Line following robot is a robot which can detect and also follow the line drawn on the floor. Here, the path will be predefined and is a black line on a white surface or it can be also a dark high contrast color. Line positions are captured by the optical sensors which will be present in front of robot. Most are using several numbers of photo-reflectors.Controlling the speed according to the lane condition. Due to the friction between the tire and the floor the speed will be less when passing a curve
Advantages : Most efficient and useful where the structure of the organisation is static.
Disadvantages : Results in slow speed and instability due to different thickness of line or complex angles.

B. Enhanced User experience through Augmented Reality [3] *:*The paper mainly discusses and focuses on the use of Augmented Reality applications needed for tourism purpose. AR is basically a visualization technique that can superimpose computer- generated graphics, for example audio, video, text, and other multimedia formats, as captured from the camera of any digital device which is on top of real world view.
Advantages :
1. With the help of the direct annotations of the particular location that user selects, they can navigate themselves interactively.
2. It can function as a tourist guide which will introduce as well as guide to target environment..
Disadvantages :
1. Lack of interoperability across mobile platforms.
2. Users need to be equipped with smartphone devices.

C. RFID Technology [4] *:* Radio frequency identification (RFID) helps to identify different objects uniquely with the help of tags which has unique id associated with it . It is known for automatic identification of technologies. In this paper principles of RFID technology and its type are discussed. RFID helps in identifying from distance. RFID tags has a large set of unique IDs which will not be present in systems that use barcode and also includes additional data such as product type, and

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measures environmental factors that includes temperature.
Advantages :
1. Tags have the capability to read/write
2. Line-of-sight is not required.
Disadvantages :
1. The cost of tags depends on their type used.
2. Collision and loss of data can happen due to reading of several tags at a time.

D. Voice Controlled Robot [5] *:*The idea behind this project is how to control a device like an Arduino or ESP8266 by using voice commands. For developing this voice-generated project, the user's voice will be captured by android device which will transform it into a set of commands that will be sent to the device. An android powered smartphone will be used by user to give voice commands. These commands with the help of an app can be fetched which further converts the voice command into text. With the help of Bluetooth module the phone is connected to the microcontroller. The app will send necessary data to the microcontroller using Bluetooth of the phone, after the conversation of the voice command into text and then further

microcontroller receives the data using Bluetooth module. Then the robot will move forward, backward, left and right according to the command.
**Advantages :** Arduino is controlled using Voice commands without using an external voice module.
Disadvantages : Use of external speakers which is not required since mobile speakers can also be used.

III. PROPOSED WORK

This robot helps in guiding the user to their desired destination with the help of voice commands. It provides assistance and information to the people in an innovative way and is used for indoor navigation. While navigating, the robot introduces the user to the surrounding using computer generated graphics and voice over to provide information about the organization. The robot plans the path of the tour based on the user input. The places are associated with a tag and a unique ID.

3.1 Architecture of System
The architecture of system is given in the below Fig. 1. Description of each block is given in the section.
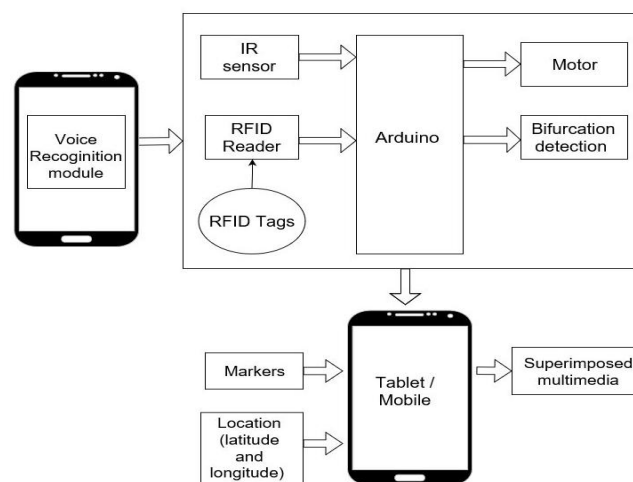
Fig. 1 System architecture

A. Input Block Description: For capturing the user's voice, an android app is used which will convert it into set of commands that further is sent to the device. The Users can interact with android app by giving voice commands which will be listened by the app to give response. After, the voice commands is translated by app to understandable form for the IoT device .
B. Path Planning Module: Here this module helps in determining the route from one location to another in form of coordinates. Path Planning module here will be used find the best path from the current location of the robot to the destination it

needs to be. The algorithm used for calculating a shortest path for graphs is Floyd-Warshall.. Shortest distances between each pair of vertices in the input graph is computed. It is done by comparing all possible paths with the help of graph between every pair of vertices and that too with $O(V^3)$ comparisons in a graph.
Firstly, matrix M of |V| x |V| is created,   that describes the distance between vertices:
For each cell (j,k) in M:
   if j == k:
     M[j][k] = 0
   if (j,k) is an edge in E:

```
    M[j][k] = weight(j, k)
    else:
    M[j][k] = infinity
for l from 1 to |V|:
   for j from 1 to |V|:
      for k from 1 to |V|:
         if M[j][k] > M[j][l] + M[l][k]:
            M[j][k] = M[j][l] + M[l][k]
```

The line following robot follows the lines drawn on the floor. This path would be a black line on a white surface or vice-versa. The basic operations of the line following are :
• The line sensing process requires high resolution and also robustness. After processing the data coming from the sensors part, the microcontroller will send instructions to driver. Voltage then will be given to motors according to the inputs provided.

C. Output Block Description: Augmented reality is used for an overlay of computer generated graphics, text and also three dimensional models and this will be over real video stream. Here the virtual information will be embedded into real world, which further augments the real scene with additional informations. It is proved to be useful in the case of several tourist. The camera of the AR system will be mounted on the robot's gripper so as to generate a virtual imitated scene for the following view.
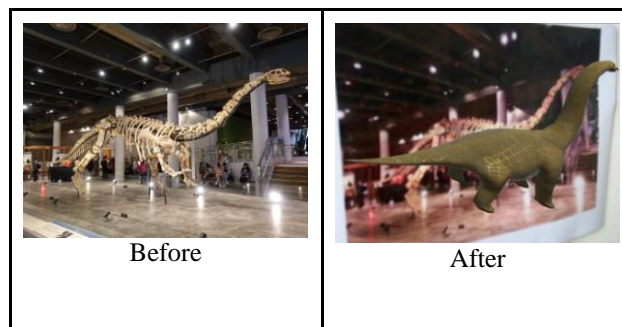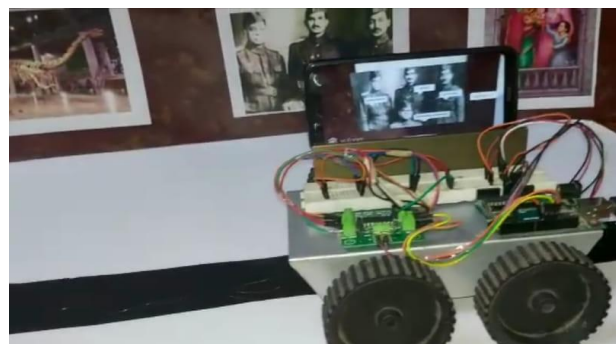
IV. WORKING SNAPSHOTS

| Before | After |

Fig 2. Augmented Reality

Fig 3. Working prototype

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