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# AUTONOMOUS TOUR GUIDE ROBOT USING EMBEDDED SYSTEM

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**Abstract:**
Today's world has numerous alluring locations that people visit. It is crucial on this occasion to value of having a tour guide with you who can explain the cultural and historical significance of various locations. The development of technology has made it possible for cell phones to have the ability to direct a traveller to any location in the world and serve as a tour guide by outlining a location's significance. However, if someone is gazing at their phone, they could not be paying attention to where they are going and could run into other people or moving objects. The person is alone and lacks a sense of connection with other travellers when using a phone as a tour leader.

A human guide is therefore required to give tours to a group of tourists. However, while delivering tour services, human tour guides may experience fatigue, distractions, and the side effects of repetitive work. Robots solve these issues and can deliver tours reliably up until their batteries run out. A tour-guide robot that can be employed in situations like this is introduced in this project. Tour guide robots may engage with people while navigating on their own in a location with a known map. There are made-up landmarks across the area. Each landmark offers details on that particular area. The screen simulates an animated avatar. The Python module Pyttsx3 offers text-to-speech and voice recognition functions for human-robot interaction.

**Keywords:**
Robot, Pyttsx3, Voice Recognition , Python

## Introduction:

Travellers visit a wide variety of locations all across the world. They might go to one of the natural wonders of the world or a monument of historical value. On this particular occasion, a tour guide is with them. The tour guide takes visitors to a variety of locations, describes the significance of a location. Thanks to current technological developments, a person can utilise a smartphone as a guide. The phone's GPS navigation system may direct users to their intended location. Smartphone assistants like Apple's Siri, Google's Assistant, and Amazon's Alexa can explain the significance of a location to a person [8].

However, using a phone while staring at it might cause a person to collide with moving objects or trip and fall if they are not careful. Additionally, using a phone guide can make a person feel lonely, older individuals may find it difficult to use a smartphone, and people who are disabled and confined to a wheelchair may not be able to use a smartphone. Possible to go along the path displayed on the phone, such as up and down stairs, etc. As a result, a human tour guide can give tours to a group of tourists, meticulously guiding them to points of interest and explaining the significance of each location. The repeated nature of the job, though, can make a tour guide feel worn out, preoccupied, and bored.

A robot can give a tour to a group of tourists during these periods. A tour-guide robot is one such robot. Robots are programmable machines that can lessen the workload of humans by performing a variety of jobs[6]. There are many different types of robots, such are mobile robots, robots with arms, robots with legs, etc. Each has a unique purpose and benefits. Only a mobile robot is the subject of this experiment [4]. A mobile robot moves around its environment using its legs, wheels, and tracks after sensing it with its sensors [6]. The wheeled mobile robot at the centre of this project. The capabilities of a tour-guide robot are implemented with this robot.

A robotics specialist often introduces the route data that a tour-guide robot need. In contrast, we suggest a robot tour guide that can be taught any path by anyone and then allowed to follow it [2]. Our robot will be able to repeat that route on demand after a brief stage of route learning. We have therefore given our robot the capability to estimate its position in the operating environment in order to record and recreate a path [5]. This is a difficult assignment due to the symmetries, moving items, and transient obstructions seen in indoor spaces.

**Contribution:**

The following are the project's goal:
1. To build a circuit of an Autonomous tour guide robot .
2. To give the proper information of the places.
3. To create a real time robot .

**Related work:**

By reviewing different paperwork and techniques of used several cleaning robots, we've started acting on our design of "Autonomous Tour Guide Robot". The papers surveyed for literature are as follows:

Răzvan Gabriel Boboc [11]. In this study, we want to deploy a robot to provide visitors with a tour inside the Brașov Research & Development Institute's Industrial Informatics and Robotics Laboratory. Numerous research tools are employed in this lab, and each time a new visitor or student stops by to see them, an operator must explain what they are used for. As part of this study, we want to employ a robot to give visitors a tour inside the Brasov Research & Development Institute's Industrial Informatics and Robotics Laboratory. The robot will be stationed at the lab's entrance and greet guests as they arrive.

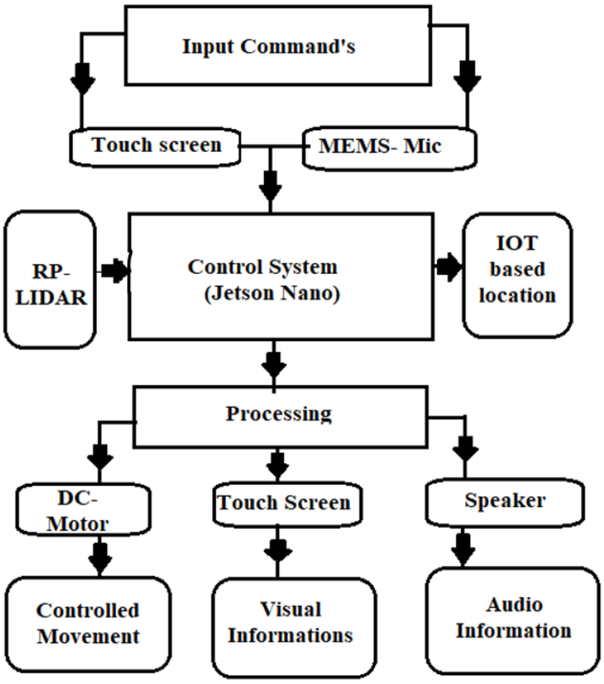
Hrudaya Kumar Tripathy [12] . The CARE acronym stands for Collision-Aware Mobile Robot Environment utilising Improved Breadth First Search. A collision-free navigation system with an ideal path from the source to the destination is a crucial need for mobile robots. Collision Aware Mobile Robot Navigation in Grid-Environment, a low-complexity, collision-free mobile robot navigation technique, is developed in this work. The suggested strategy makes use of a predetermined decision table for navigation, a hybrid approach for path planning, and the Radio Frequency based Identification method for mobile robot localization.

Antonio Chella [13] . An autonomous, interactive tour-guide robot's software architecture is discussed in this article. It offers a distributed, modular software architecture that combines planning, localization, mapping, collision avoidance, and a number of user interface and web-based telepresence-related modules. Online learning, any-time algorithms, and probabilistic computation are at the core of the software approach. It allows robots to work safely, dependably, and quickly in extremely dynamic conditions without modifying the environment in any way to facilitate the robot's operation.

Roger A. Søraa [14] .The secret lives of Automated Guided Vehicles (AGVs) at a Norwegian hospital This paper have explored how the domestication of robots in a hospital setting can take a wide variety of forms through a case study on how Automated Guided Vehicles (AGVs) have been domesticated at a Norwegian hospital. It shows how the robots are domesticated both practically, symbolically and cognitively.

V. Alvarez-Santos [15] . Robotics experts typically add route information into tour-guide robots. We enable the robot to learn new routes while adhering to an instructor in the tour-guide robot we are creating. In this study, we discuss the route recording procedure that occurs while a human is being followed, as well as the technique by which such routes are subsequently recreated.

**Methodology**




In this project we have used Jetson Nano- B01, RP-LIDAR, DC motor, Motor driver(L293d), Battery(12v , 8Amp), 7-inch HDMI touch screen, MEMS mic. This all works on a battery. There will a button to start the robot, after starting robot code in Jetson Nano get started, after that RP-LIDAR visualize its path by avoiding obstacles and if there are no any obstacles then it will move forward. If there are any obstacles then it turns left or right according to the condition . Motor driver drives the motor and the robot will move according to the given orders and convey the information to the visitors. We can give the commands to the robot by touch screen or the mic present over there. By analysing the commands robot will provide the information in visual as well as audio format through the screen & Speaker respectively.

**Algorithm**

Step 1: Collection of information about the project.
Step 2: Selecting components.
Step 3: Design of circuit & it’s hardware parts.
Step 4: Assembly of the all components.
Step 5: Simulation of project.
Step 6: Final result.

**Flow chart**

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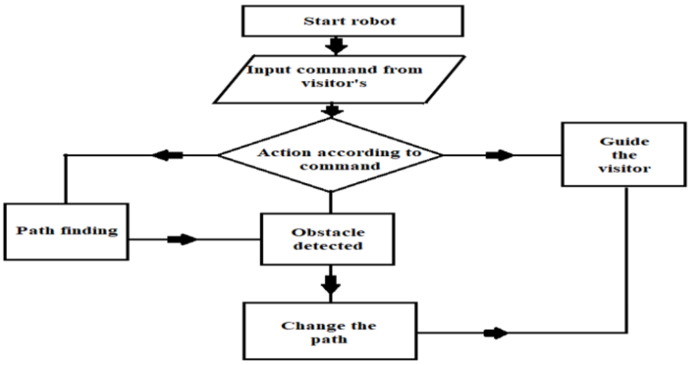
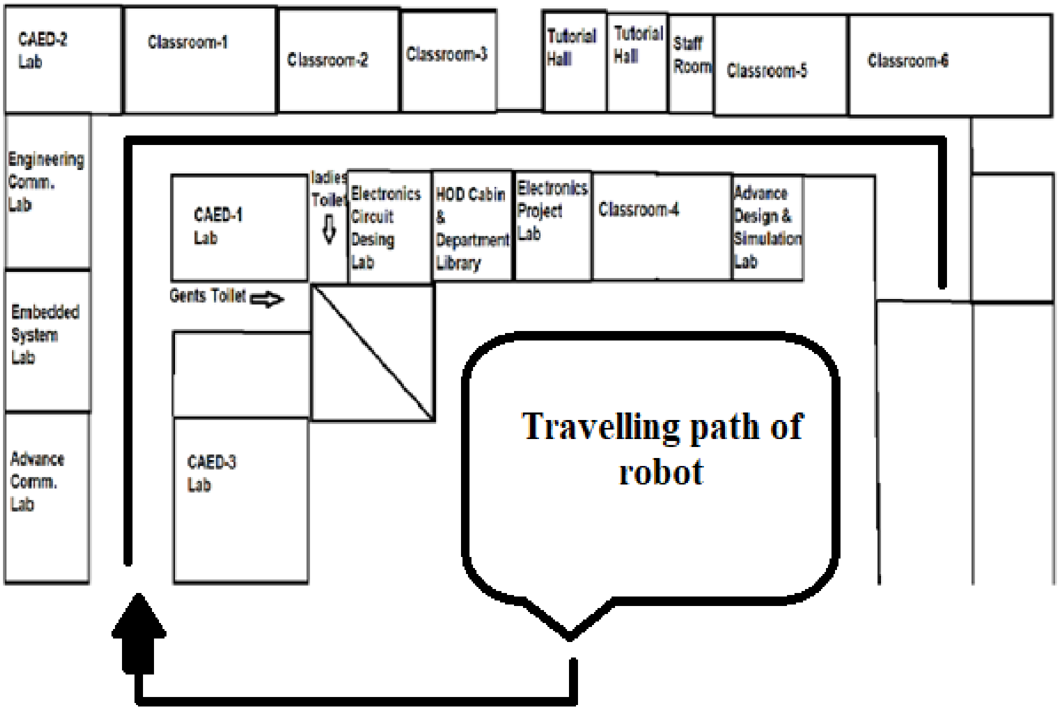



RP LIDAR and all the hardware elements and programmes are combined using the Jetson Nano. The robot is programmed to carry out the task of informing the guests. The robot unveiled the feature that makes it so simple for anyone to use it.

**Modules and Specification's**

| Sr.No | Name of Components | Specification's |
|---|---|---|
| 1. | Jetson Nano | 2GB |
| 2. | RP LIDAR | $360^0$ |
| 3. | DC Motor | 100rpm |
| 4. | Motor Driver | L293d |
| 5. | HDMI Screen | 1024*600 |
| 6. | Wheels | 50mm |
| 7. | MEMS Mic | 10KHZ to 20KHZ |

**Navigation Path**



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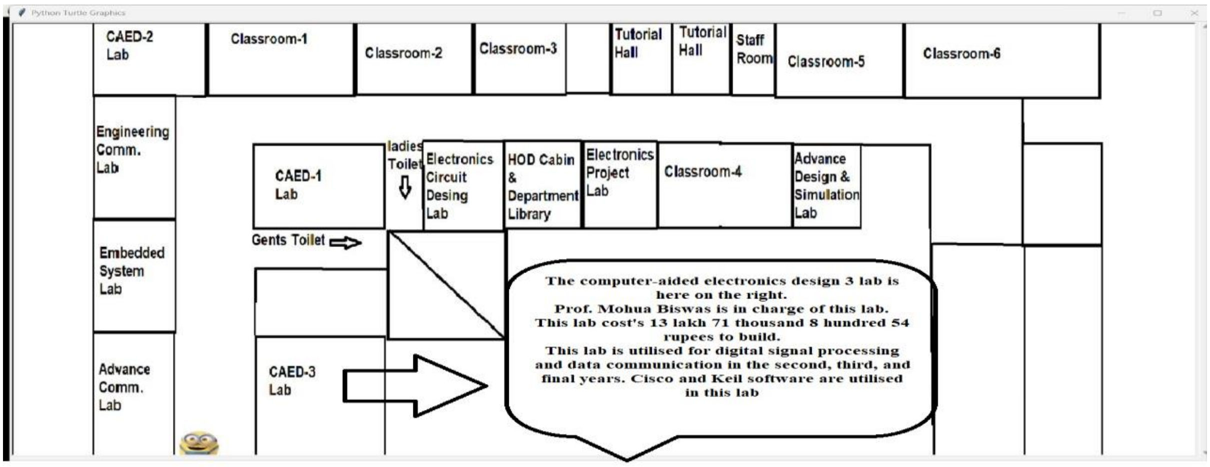
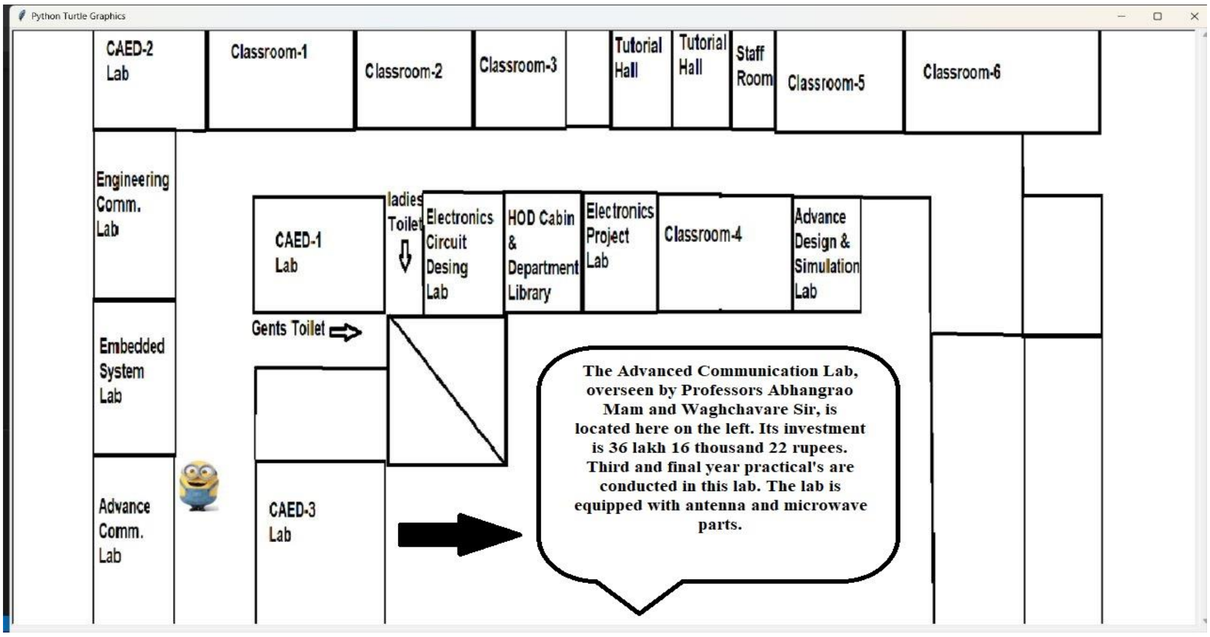
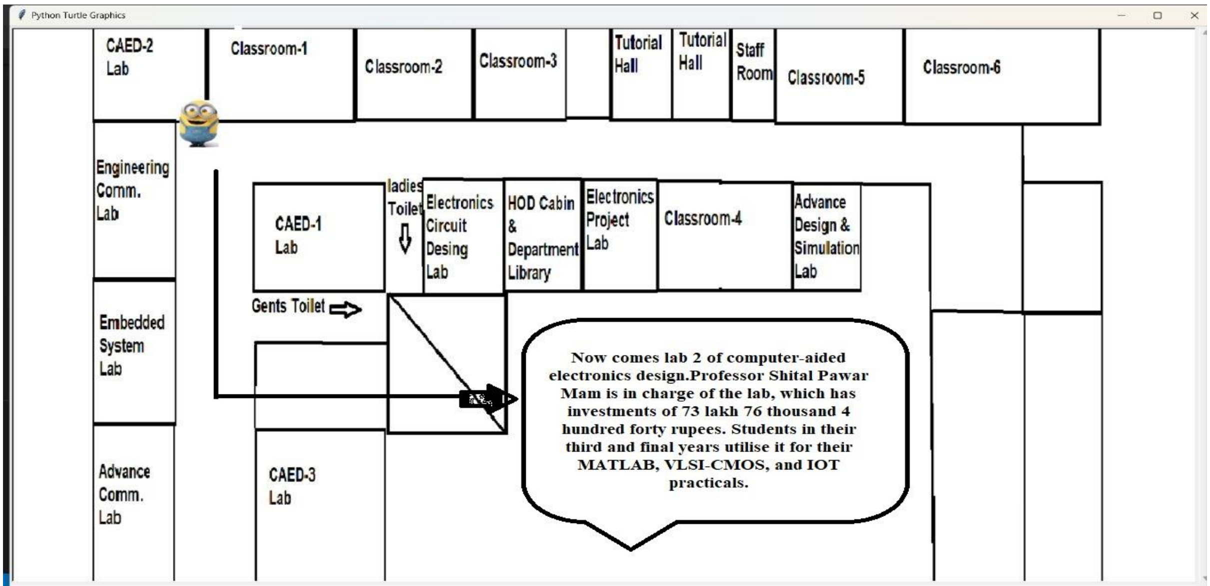
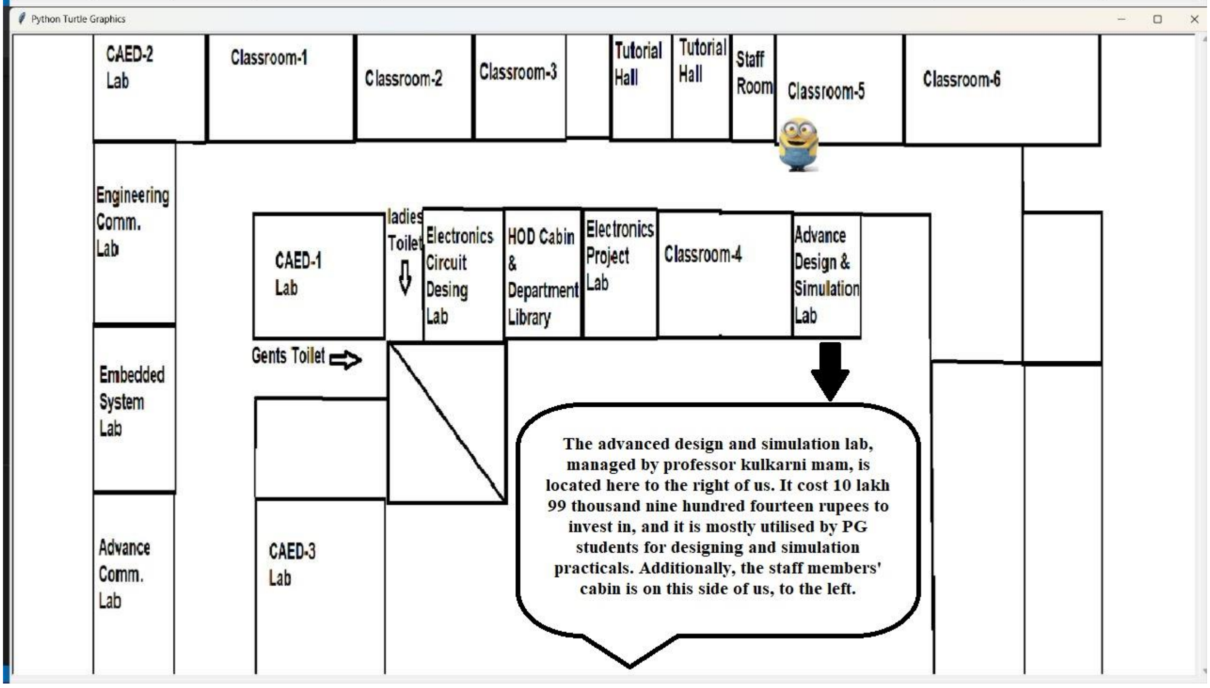
The robot will travel in accordance with the established checkpoints and provide information to visitors to the department. It is preferred to the location if information is provided on the screen in both text and voice form.

**Virtual screen results:**




Python Turtle Graphics
CAED-2 Lab
Classroom-1
Classroom-2
Classroom-3
Tutorial Hall
Tutorial Hall
Staff Room
Classroom-5
Classroom-6
Engineering Comm. Lab
CAED-1 Lab
ladies Toilet
Electronics Circuit Desing Lab
HOD Cabin & Department Library
Electronics Project Lab
Classroom-4
Advance Design & Simulation Lab
Gents Toilet
Embedded System Lab
Advance Comm. Lab
CAED-3 Lab
Now comes lab 2 of computer-aided electronics design.Professor Shital Pawar Mam is in charge of the lab, which has investments of 73 lakh 76 thousand 4 hundred forty rupees. Students in their third and final years utilise it for their MATLAB, VLSI-CMOS, and IOT practicals.


Python Turtle Graphics
CAED-2 Lab
Classroom-1
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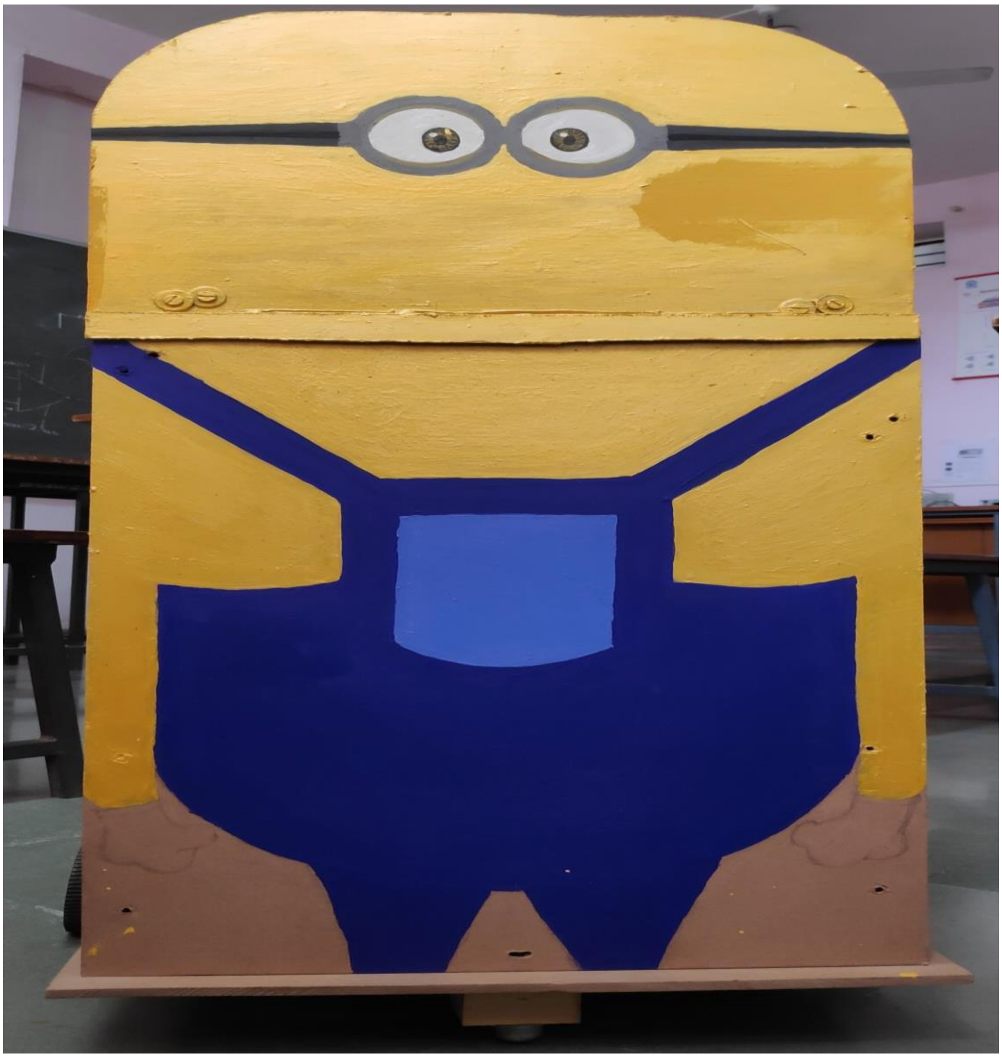
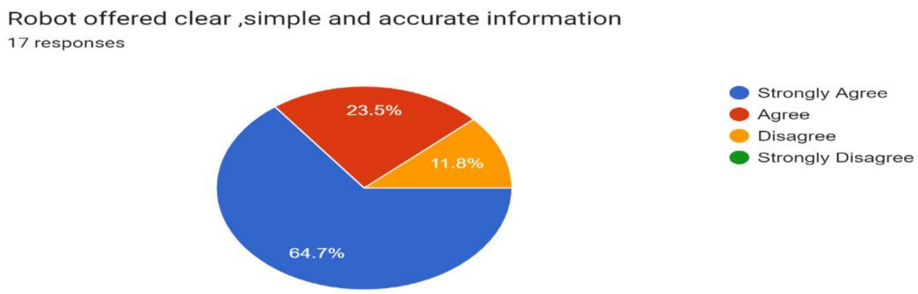
Electronics Circuit Desing Lab
HOD Cabin & Department Library
Electronics Project Lab
Classroom-4
Advance Design & Simulation Lab
Gents Toilet
Embedded System Lab
Advance Comm. Lab
CAED-3 Lab
The advanced design and simulation lab, managed by professor kulkarni mam, is located here to the right of us. It cost 10 lakh 99 thousand nine hundred fourteen rupees to invest in, and it is mostly utilised by PG students for designing and simulation practicals. Additionally, the staff members' cabin is on this side of us, to the left.



**Qualitative Analysis:**



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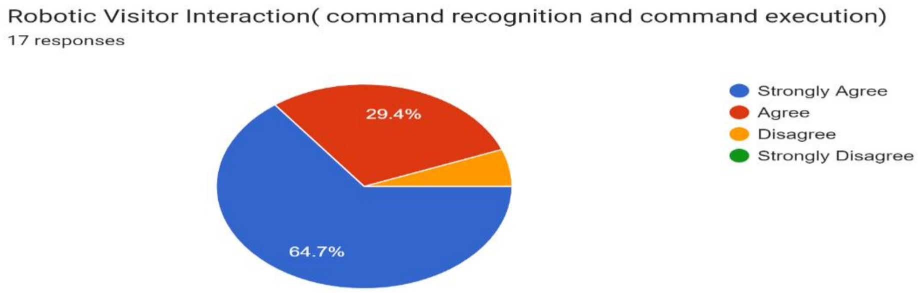


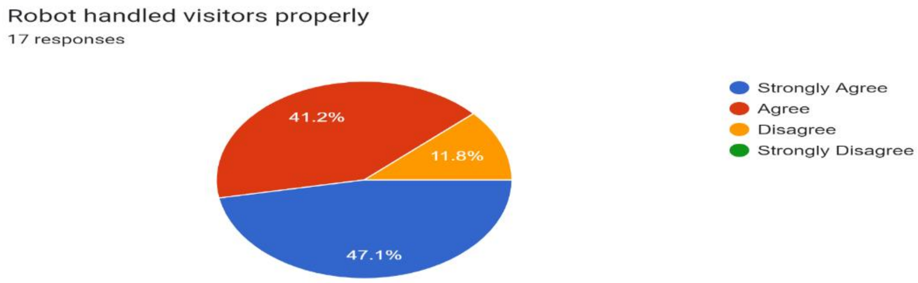


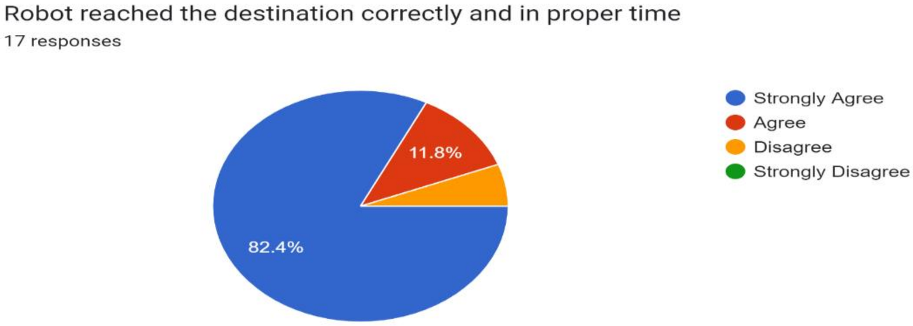


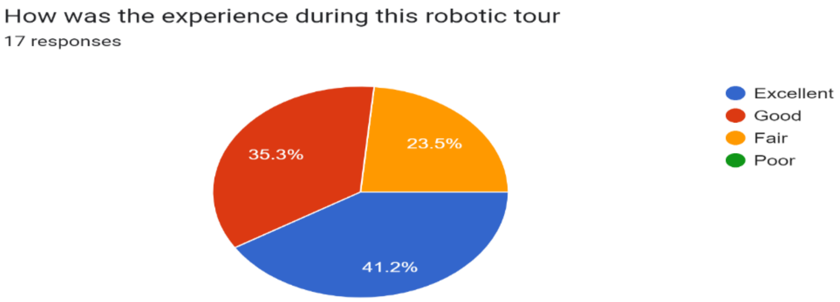


The survey was conducted based on the visitors that came to our institute and the results are shown above .

**Result**

Tourists that visited the robot at the departmental location usually described their experience as "satisfactory and fun." The department where the robot is working is shown on a map in the illustration. We have found that the robot operates most well when there are up to 8 people on the trip and the route is not too congested, which is a normal circumstance. In this instance, everyone taking the tour stays in front of the robot while it moves around the room, leaving the space clean. The robot does its own tour without incident, even when there are people in front of it or people who are partially blocking exhibit cases. When there are more people on the tour, it sometimes happens that visitors move from in front of the robot to all around it. In this situation, the robot can become stuck due to its behaviour in avoiding obstacles. Instead, the robot may be unable to identify its way when the room is busy, which generally happens when some school-class guests visit the department. As a result, the robot is unable to localise itself. Robot is waiting to correct the issue in both situations after some time.

**Discussion:**

The robot was departmental level operational. The information provided by the robot was simple for visitors to understand when they visited the department. Robot had given the visitors correct information in audio and visual formats, making for an amazing experience. We anticipated that the robot would function at his best in a busy environment because of its capacity to avoid obstacles. However, when the robot encounters additional impediments, it becomes confused and becomes trapped in place. The robot's functioning is restarted after some time has passed. Robot successfully delivered information to the visitor. Robot began to work on it as soon as it received the visitor's order. Robot will display the information in visual form on the screen if the visitor is expecting it to be that way, and it will display it in auditory form if they are expecting it to be that way. Robot has distributed information in both formats at several sites.

**Conclusion:**

The created robot is completely functional and follows every command given by the operator or visitor. As this is the wireless robot is having ability to navigate its path and avoid the obstacle in the route. This robot is providing the information with so much accuracy . this robot is also having the ability of mobility to any other location by the operator commands.

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