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Concept and Implementation of Self Parking Chair

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ABSTRACT

In the offices it becomes necessary to move the chair manually after the meetings and routine work. Manually the movement of chair may be time consuming and not appropriate. This problem can be eliminated with the concept of self parking chair. This paper describes the design of a smart, motorized, voice controlled parking chair using MATLAB. This is a unique chair that automatically moves to a set position. The chair has the features such as camera to capture the images, sensors to sense the position blue tooth module and microcontroller. The chair includes a wheel to automatically move 360 degrees paired with a system that indicates the target position. When clapped, the chair grabs this information and acts upon it, so as to slide back into its original position.

Keywords : Self Parking Chair,Bluetooth module, microcontroller, camera, motor driver IC.

I. INTRODUCTION

In the previous years, a considerable number of research works and industrial advancements on Intelligent Parking Assist Systems (IPAS) have been proposed, including both assistance and automatic parking approaches. In today's scenario automation of anything is being applied to each and everything to make it easy for human being to save their time and reduce the mistakes which are done by the human during the work.

In offices the chairs are arranged manually. In case of back to back meeting arranged in same hall, then at that time the arrangement of chair is impossible and the hall look little bit untidy because of spreading of chairs at different locations. So for working anywhere, cleanliness and tidiness is important. The answer to this problem is the design of self parking chair which save time, manpower and the look of the meeting hall. When you clap, the chair takes this information and acts upon it, sliding back into its original position as though you and colleagues were never there.

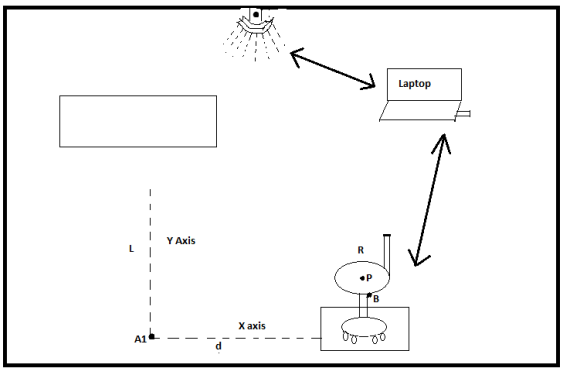

Figure 1. Preview of System arrangement

II. RELATED WORK

The objective of this work is to present self parking chair with clapping system and automatic operation to reduce human efforts, time and error due to negligence.

Prototypes of smart parking chair have been developed based on technology to help while arranging the chair in offices. In February 15, 2016Nissan sent out a news announcement on its self moving chair. The Intelligent parking chair is a special chair that automatically moves to set position. The chair includes a roller to self propelled 360 degree paired with a system that indicates the target position. Four cameras placed on the rooms ceiling generate a all around view to wirelessly transmit the chair's position and its byway to destination and fitted motors to drive the wheels at its base. The chair is moving by rotating camera over wi-fi module.

In this paper, the self parking chair using Bluetooth module has been proposed. The design and development work for the said chair has also been carried out as the project work at undergraduate level. The software contains digital image processing for chair detection and generating command signals for interfacing the chair. Automated obstacle detection and avoidance had been done using sharp sensor, which help to stop the chair in case any obstacle suddenly comes in the way of park chair and then chair moves towards the destination point. The self parking chair system utilizes the transmitter- receiver module, cameras, sensors, microcontroller, motor driver IC and the DC motors. The details and the structure of it are shown in fig. 1,2 and 3 respectively.

Receiver

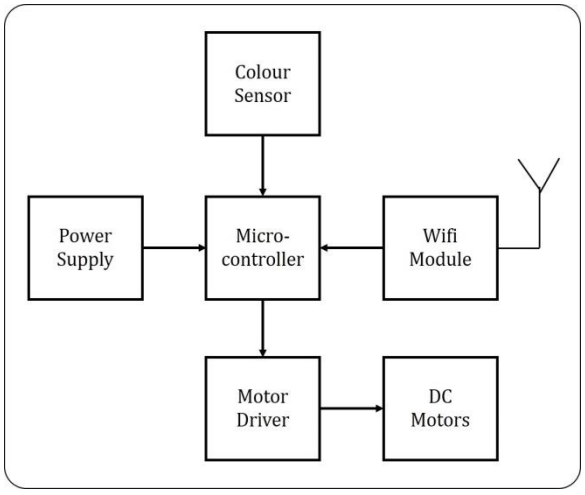

Figure 2. Receiver module

Transmitter

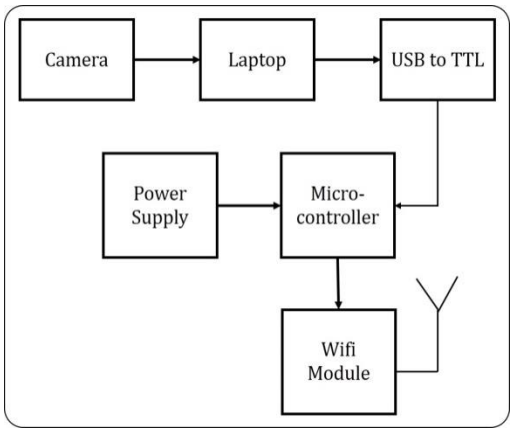

Figure 3. Transmitter module

Camera

Camera is used for capturing the image of the chair for image processing. The camera is placed on the roof under the room at fixed angle. The 10 mp camera is wirelessly connected to the chair by Bluetooth module and laptop having the internal Bluetooth software.

Clap sensor

LM358 sound sensor is used in the circuit of the chair. The sound of clap has been set by potentiometer which is placed on the circuit of LM358. Sound signal is converted into electrical signal and that electrical signal is converted into the mechanical movements of the chair.

Microcontroller

Microcontroller ATMEGA328 is placed on the chair platform; it is connected to the sound sensor and wirelessly connected to the camera with Bluetooth module.

Motor driver IC

L293D is a standard Motor Driver IC which allows DC motor to drive in either direction. L293D is a 16-pin IC which can control a set of two DC motors synchronously in any direction. It means that you can regulate two DC motor. For moving the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

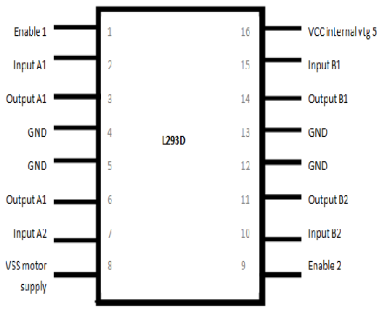

Figure 4. Pin configuration of L293DMotor driver IC

Logic used,

- ✓ **Pin 2** = **Logic 1** and **Pin 7** = **Logic 0** | Clockwise Direction
- ✓ **Pin 2** = **Logic 0** and **Pin 7** = **Logic 1** | Anticlockwise Direction
- ✓ **Pin 2** = **Logic 1** and **Pin 7** = **Logic 1** | Idle [No rotation]
- ✓ **Pin 2** = **Logic 0** and **Pin 7** = **Logic 0** | Idle [No rotation] [Hi-Impedance state]

WorkingPrinciple

When user claps, then all randomly placed chairs move towards table and will be arranged in proper manner. The sound sensor(RC-A-09) sense the sound of clap and it will send the signal to the microcontroller(ATMEGA 328), the Bluetooth module(HC 05) connected to the microcontroller, send the signal to the camera which is connected to the laptop. This camera is placed on the roof of the room at particular angle. Laptop has already inbuilt program using Matlab. By using the Matlab program, the location of chair is automatically traced; from chair location to the table location the distance is calculated. For turning purpose, two indication points are provided on the chair. Camera detects two three points at a time.The chair distance is calculated using Matlab programming and then the chair will automatically take the turn towards table. Four DC motors are connected to the platform of the chair. 12 volt power supply is provided to the motors. For converting the signal voltage, we used the USB to TTL cable. This USB to TTL cable is converted from 12 volt to 5 volt for the microcontroller. The motor driver IC (L293D) is used for drive the motors on either direction. L293D is a 16-pin IC which can regulate a set of two DC motors synchronously in any direction. Then the chair will move towards the table automatically.

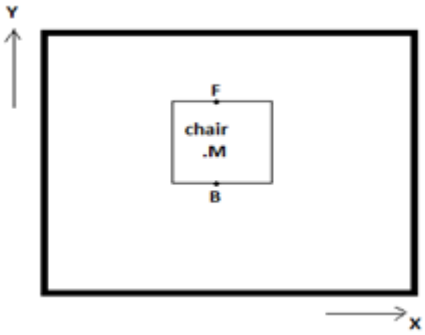

Figure 5. Chair position Plot1

Figure Chair Plot 1

F=(x_1,y_1)

B=(x_2,y_2)

M=(X,Y)

To calculate tilt angle with x-axis of B-chair.

$<B=\tan^{-1}(\frac{y_2-y_1}{x_2-x_1})$

From angle B we can find the front distance of the chair to move it properly.

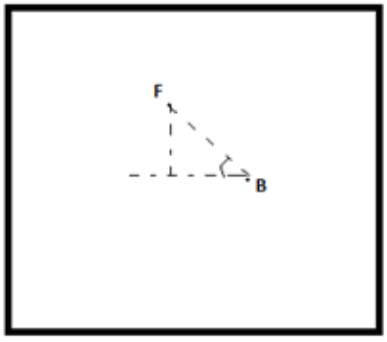

Figure 6. Chair position Plot 2

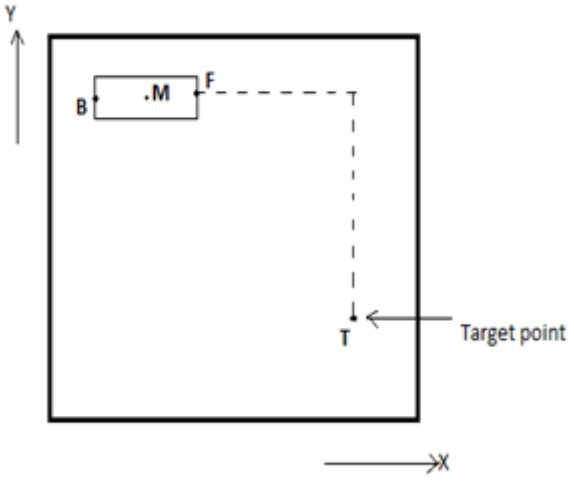

Figure 7. chair position plot 3

After finding the front of the chair we have to calculate the distance i.e. horizontal and vertical distance from its target point.

T=(x_T, y_T)

M=(x_M, y_M)

Horizontal distance=$x_T - x_M$

Vertical distance=$y_T - x_T$

III. CONCLUSION AND FUTURE SCOPE

Self parking chair is a compact, automatic chair and easy to handle. Automation reduces the error in placing the chair at appropriate location. This will reduce the manpower and within a short period of time, the randomly arranged chair in the offices will be placed automatically in proper manner by just a clap. This project work at UG level is presented and the model of it is already built up and tested in the laboratory. This model can also be used for number of chairs in offices and vehicle parking system.

IV. REFERENCES

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