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Smart Self-Parking Chair

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***Abstract*: An amusing video has surfaced about an intelligent parking chair inspired by Nissan; the video shows the chairs swinging into action, self-guiding to finally park at a table in response to a person. They can also reverse and turn. T3 called them "robot thrones." Its story said, "Japanese car manufacturer Nissan continues its foray into the world of robotics with a series of experimental motorized chairs." Nissan, it said, pulled this off, in step with Okamura; the latter is a furniture maker with a portfolio that includes business-ready furniture for offices and conference rooms. "The Intelligent Parking Chair is promotional project that materializes Nissan's corporate vision of 'enriching people's lives through technology.' It was produced in collaboration with the award-winning creative team BIRDMAN. This concept aims at increasing knowledge around the latest technology adopted by Nissan vehicles, while showing how this is slowly changing our daily lives."**

***Keywords*: L293D, RF Module, MATLAB, Camera, Motor etc.**

1. Introduction

Vision-guided robotics has been one of the major research areas in the mechatronics community in recent years. The aim is to emulate the visual system of humans and allow intelligent machines to be developed. Self-parking chair one kind of parking units that follow various working area. Nowadays the creations of Self-parking chair model can be found from Nissan technology, as it give advantages in our lives. It works just like a robot as it is able to sense and response to the environment. Considering that, Self-parking chair should be well developed to optimize its benefits to our own living. The aim of this project is to build a prototype of a Self-parking chair model that can move on a flat surface with its two driving wheels and a free wheel. Camera is interfaced with PC for image acquisition. Mat lab is used for image processing. Path can be easily determined by user on working area image by GUI application.

Communication between PC and controller robot can be carried out by RF module. Based on the location of vehicle commands will be sent from pc to controller robot using RF module. Controller robot will then move robot forward, backward, left, stop or right. The Intelligent Parking Chair is a promotional project that materializes Nissan's corporate vision of "enriching people's lives through technology". It was produced in collaboration with the award-winning creative team BIRDMAN. This concept aims at increasing knowledge around the latest technology adopted by Nissan vehicles, while showing how this is slowly changing our daily lives. The "Intelligent Parking Chair" was inspired from Nissan's latest "Intelligent Park Assist" technology. The base "Bird's-eye view" and "Automatic Movement" concepts are also introduced in the Intelligent Parking Chair. Conversely, the surprise and comfort earned from this effortless process can be equally seen in the Intelligent Parking Chair.

2. Literature survey

Yokohama, Japan, CEO: Carlos Ghosn) announced the first "Intelligent Parking Chair", a concept inspired by its intelligent park assist technology that allows drivers to easily park their vehicles using automatic steering. The "Intelligent Parking Chair" is a unique chair that automatically moves to a set position. The chair includes a roller to automatically move 360 degrees paired with a system that indicates the target position. Four cameras placed on with this innovation in office technology, Japanese businessmen are now freed from the troublesome task of arranging chairs, using this new technology already adopted in the X-Trail Hybrid and other Nissan vehicles. The "Intelligent Parking Chair" is inspired by Nissan's "Intelligent Park Assist" technology. The "Intelligent Parking Chair" was inspired from Nissan's latest "Intelligent Park Assist" technology. The base "Bird's-eye view" and "Automatic Movement" concepts are also introduced in the Intelligent Parking Chair. Conversely, the surprise and comfort earned from this effortless process can be equally seen in the Intelligent Parking Chair. A one of a kind answer for the issue of cleaning up lines of seats after office gatherings a notable Automakers Nissan have built up the innovation. The Japanese firm has concocted self-fuelled office seats that stop the rearranged seats themselves over into their stopping position with the sound sensor. This Japanese organization utilized four movement delicate cameras toward the edges of a roof and utilized them to track general office seats on wheels this innovation is otherwise called picture handling.

The Wi-Fi controlled cameras find each seat's area and it takes after the course back to its beginning stage. The room format is pre modified into the framework, with singular seats allocated their own spot at the table. The seats have been customized to react to the sound sensor or the hints of a human

applaud, with each seat consequently backpedals to its underlying position. We were really taking a gander at office seats as a theme and seek there is a need after this in some real organization, in their gathering room. "Nissan's definitive objective is self-driving (autos), and the self-stopping part is only one of the procedures en route. More than considering them just furniture, we trust individuals can consider it to be the means by which our innovation can be brought into different articles". Some even said they wished to see it in their own homes like examination room, feasting table and so forth [1] from the innovation and learning behind its self-stopping autos, Nissan planned what it calls the "Intelligent Parking Chair.

3. Proposed system

The paper is focused on achieving a single task (automatic parking) by integration of sensors and actuators controlled by microcontroller and strategy planning/coding, therefore the vehicle platform is not built from the parts but from modifying a RC toy car instead for saving the time. There are generally three kinds of parking patterns: parallel, front/back-in perpendicular, and with an angle (usually 45degrees), and this project is just focused on the parallel parking. The modified toy car is expected to do the following tasks in a complete automatic parking process:

- Once the length of a parking space larger than the length of the car plus a buffering distance is detected, the chair will stop automatically.
- Perform a smooth and efficient parking behaviour according to the relative positions of the car and the parking space.
- The automatic chair parking system has the following major components:
- The chair consists of 12V DC a servo motor in the front and 12V DC power supply.
- Microcontroller 89c51, L293D motor driver interfaced with the servo motor and microcontroller.

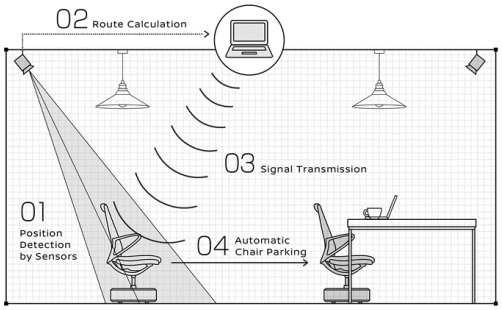

Fig. 1. Schematic representation of automatic self-parking chair

4. System description

This project is divided in to the two parts one is Camera and MATLAB Image acquisition and another part is Chair Design as Follows.

A. MATLAB Image Acquisition

In first part of our project module. We have implemented the Web cameras across the top corners of the rooms which can take the Birds eye view of entire room area.

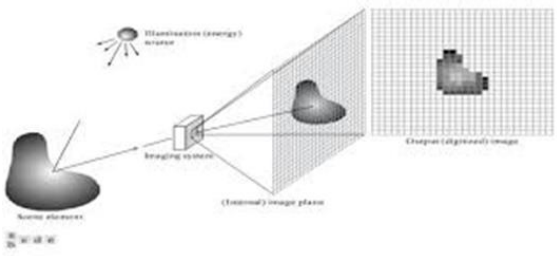

Fig. 2. Object detection

After the image is taken the various processing methods we will apply on it and then we will detect the various objects present in the room. MATLAB has built in object detection algorithm is there with help of that we can identify and detect all chairs among all other objects which are present in that room. Then it will generate the report of no of Chairs presents and its geographical 3D map. After that by running our program of nearest location arrangement it sends the signal to hardware parts through wireless RF link.

B. Chair design

This chair is designed by taking the consideration of all aspect as per user convenience. The main hardware of this chair is built using the FPGA Controller board. And then we have attached the motor driver Module to this board. Whenever the chair is gets misplaced the MATLAB send command through the RF link to the main FPGA board then this FPGA board will decide what to do like forward, reverse, left, right movements.

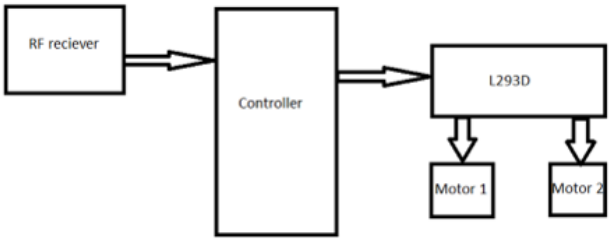

Fig. 3. Chair assembly

5. Hardware design

A. FPGA (SPARTAN 3)

This is a Spartan XC6SLX9 with CSG324 package. Having DDR memory of 166MHz 512Mb LPDDR. With 16mb SPI flash memory with on-Board USB 2.0 interface for flash programming. It has on Board 8 LEDs, Six Push Buttons, VGA connector, Stereo jack, Micro SD card adapter.

Fig. 4. FPGA (Spartan 3)

B. L293D Motor Driver

The L293D is quadruple high-current half H-Bridge. It is designed to provide bidirectional drive currents of up to 600 mA at Voltage from 4.5V to 36V. Both devices are designed to drive inductive loads such as relays, solenoids, DC and bipolar stepping motors as well as other high current/ High-voltage loads in positive-supply applications. All inputs are TTL compatible. Each output is a complete totem-pole drive circuit. With a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs with drivers 1 and 2 enabled by 1, 2 EN and drivers 3 and 4 enabled by 3, 4 EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enables input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

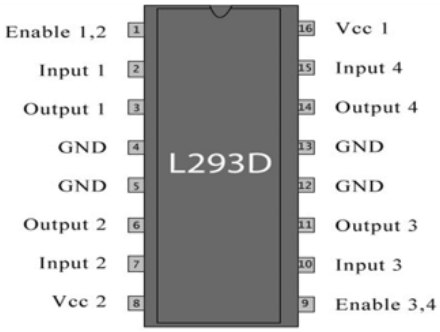

Fig. 5. Pin diagram of motor driving IC L293D

C. RF Transceivers

The RF Transceivers is a transmitting and receiving module which uses the electromagnetic waves for its data transmission. This module is connected with encoders and decoders for data transmission while communicating with each other. We have used this module as because we have a low distance of communication range and low data bandwidth as we are just sending the commands through it. And we can be able to interface this as many ways like 4:1 mux interfacing type or via serial interface. The RF module can be interfaced with any microcontroller as it doesn't needs any library for communication.

Fig. 6. RF transceiver module

6. Results

Step 1: Initialize the software with coding the program on MATLAB interface.

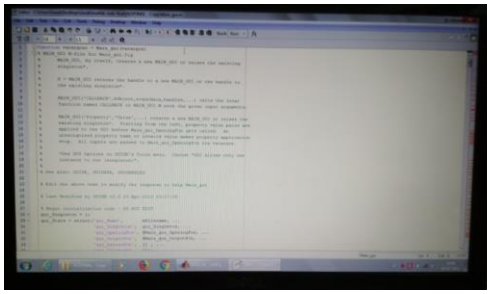

Fig. 7. MATLAB interface

Step 2: After successfully running the code, initialize the com port to which web camera is connected.

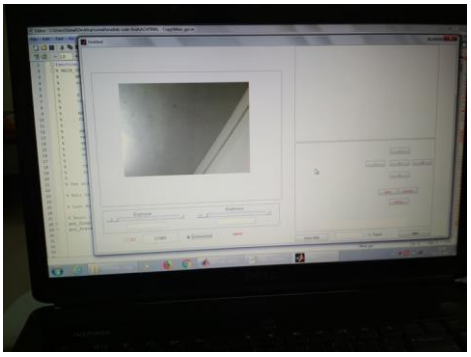

Fig. 8. Web camera connect

Step 3: Detect the location of chair using web Camera.

Fig. 9. Location detect

Step 4: Draw the path of the chair where it should be displaced.

Fig. 10. Path of chair

Step 5: Track the path of chair by sending commands.

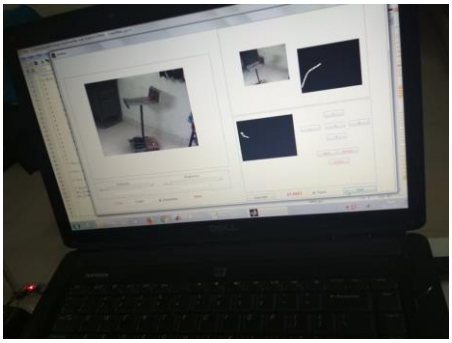

Fig. 11. Track the path

7. Other specification

A. *Advantages*

1. Path can be easily updated.
2. Eliminates the need of different sensors (IR, Proximity, Magnetic field sensor) thus makes system more compact and cost effective.
3. Possible to continuously track location of the chair and avoid obstacles in path.

B. *Applications*

1. Widely useful in conference hall, offices, public field.
2. Can be used at community service halls.

8. Conclusion

Using this system, we can reduce the human effort. It is a self-Parking system because of this there is no manual operation required. Due to this we can easily arrange the chairs in their Respective places just by giving the interrupt to the chair. Using this system, we can reduce the human effort. It is a self-parking system because of this there is no manual operation required. Due to this we can easily arrange the chairs in their respective places just by giving the interrupt to the chair. The concept of utilizing anisotropic magneto resistive for indoor localization has been shown to be both technically and economically feasible. The magneto resistive positioning robot was successfully designed to provide autonomous navigation for indoor applications. In the near future, we plan to improve the localization and navigation algorithm to improve accuracy. Further analysis will be performed to accurately identify a specified location by placing advanced magnetic field detecting sensors at different orientations.

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