

ARTIFICIAL INTELLIGENT ROBOT WITH OBJECT DETECTION, BLACK & WHITE SENSORS (AIROB)

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Abstract — In today's era of digital world, we use computers for operations like making notes, banking, booking tickets, paying bills and many more. With the expansion of Artificial Intelligence, the human intervention in many works has been minimized. A robot is a machine, programmable by a computer and is capable of carrying out a complex series of actions without much human involvement. Robots can be guided by an external control device or the control may be embedded within. The future development comprises of adding artificial intelligence to robots, reducing the human labor volumes. This helps developers to concentrate more on creative work, increasing the productivity and leaving the repetitive tasks to robots. In our project, the AI based robot, AIROB, is interfaced with sensors and uses ATmega328P microcontroller embedded on the board. The microcontroller used here is of high speed, more efficient and highly economical. AIROB traverses the arena and identifies the path to reach the specified target by detecting the obstacles using its sensors on either side. AIROB takes a selected predefined target using a 4-way DIP switch after turning the power supply ON. Using left hand priority rule, AIROB travels the path by constantly validating its current position with the target provided. Once it reaches the target, it displays the IP address of the target position on control monitor. For accurate angular rotations, it uses two servo motors, each attached to either of its wheels. AIROB can be used in real life applications like Robotic pool cleaners, sweepers, vacuum cleaners etc with little modifications.

Keywords - Artificial Intelligence; Robot; ATmega328; Servo motors

I. REVIEW OF LITERATURE

A literature review is an evaluative report of information found in the literature related to the selected area of study. The review describes, summarize, evaluate and clarify this literature. It gives a theoretical base for the research and helps in determining the nature of research.

A. Overview of the Project

The purpose of AIROB is to automate the procedure, in which the robot takes the target from the user and navigates itself through a maze and reaches target. Instead of having any human guidance for the navigation, the robot uses AI and the logics embedded in it to navigate itself to the target. The code is written in embedded C language. Embedded C is an extension to C programming language that provides support for developing efficient programs for embedded devices.

B. Existing and Proposed Systems

(1) Existing System:

Generally, remote control robots were used, based on the work of Nikola Tesla, who had constructed an electrical boat that could be remotely controlled by radio. Through the time, they have evolved from remote controlled models to the models functioning using sensors and neural networks. The most prominent navigation robots present were in the form of drones which generally travelled by the commands provided by the human operating at the base, that is, models which were previously present were mostly human guided. Automation has only been in effect to the industrial robots which are of high budget and not available for everyone.

Disadvantages: The rectification of the model in a situation where some bugs arrived was also very difficult.

(2) Proposed System:

The developed model identifies the target given through user automatically using the sensors integrated with the microcontroller board. The procedure status is correspondingly displayed on the LCD display provided. The path in which the robot moves in the puzzle is determined by the code embedded in the robot. The logic embedded ensures the automation for the model.

Advantages: The status is parallel shown on the serial monitor, so errors in the process can be identified with ease.

II. PROPOSED MODULES*Hardware Components*

The detailed specifications and working of the hardware components used in this AIROB are summarized below.

- **MICROCONTROLLER ATmega328:** The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family. It has a modified Harvard architecture 8-bit RISC processor core.
- **NE555 Timer I.C:** The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element.
- **TSOP1738:** The TSOP1738 is a member of IR remote control receiver series. This sensor module consists of a PIN diode as shown in Fig 5.4 and a pre amplifier which are embedded into a single package.
- **LM393:** The LM393 is a dual independent accuracy voltage integrated circuit operated with single or else split supply.
- **ESP8266EX:** ESP8266EX provides efficient power usage, compact design and reliable performance in IoT industry. When hosted in an application, it promptly boots up from the flash.
- **SERVO MOTOR:** A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.
- **7805 REGULATOR:** 7805 is a voltage regulator integrated circuit. It is a member of 78XX series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value.
- **DIP (Dual In-line Package) Switch:** DIP Switch is a set of small switches in a DIP (dual in-line package) used to change the operating mode of a device.

III. EXECUTION STEPS

Step1. First the AIROB is placed on the arena at the START position and the power supply is switched ON, the power supply is regulated using a voltage regulator (7805) for generating a constant voltage of 5V.

Step2. After switching on the power supply, the AIROB is started with a "start button" and a delay is provided to it so that it does not start moving randomly without a proper target. This delay gives sufficient amount of time for selecting a target.

Step3. With a DIP switch, the desired target among the given 4 targets present in the designed arena is selected. The arena has walls on either side of the white pathway and some openings so that the AIROB can either turn towards its left or its right based on preconditions. The AIROB uses a left-hand priority rule i.e., it gives more priority to the left-hand side when it needs to choose a direction to take a turn.

Step4. To identify its next move, the AIROB uses its 5 object detection sensors (TSOP1738 + NE555), one at the front and 2 sensors on either side of each wheel which helps it to detect the obstacles and free space. With the help of object detection sensors, it turns to an angle. For an accurate angular rotation which is based on preconditions, we use 2 servo motors, each one attached to a wheel respectively.

Step5. The AIROB moves on the white pathway until it identifies the specified target using powerful black and white detection sensor (LM393). A serial monitor is used to let the user know about the status of the AIROB.

IV. OUTPUT SCREENS

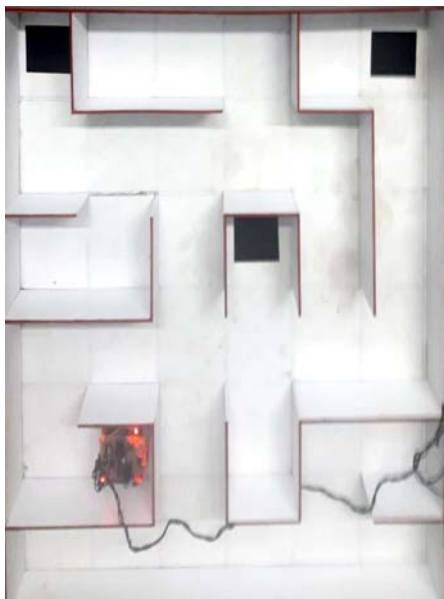


Figure 1. AIROB at Target 1



Figure 2. AIROB at Target 3

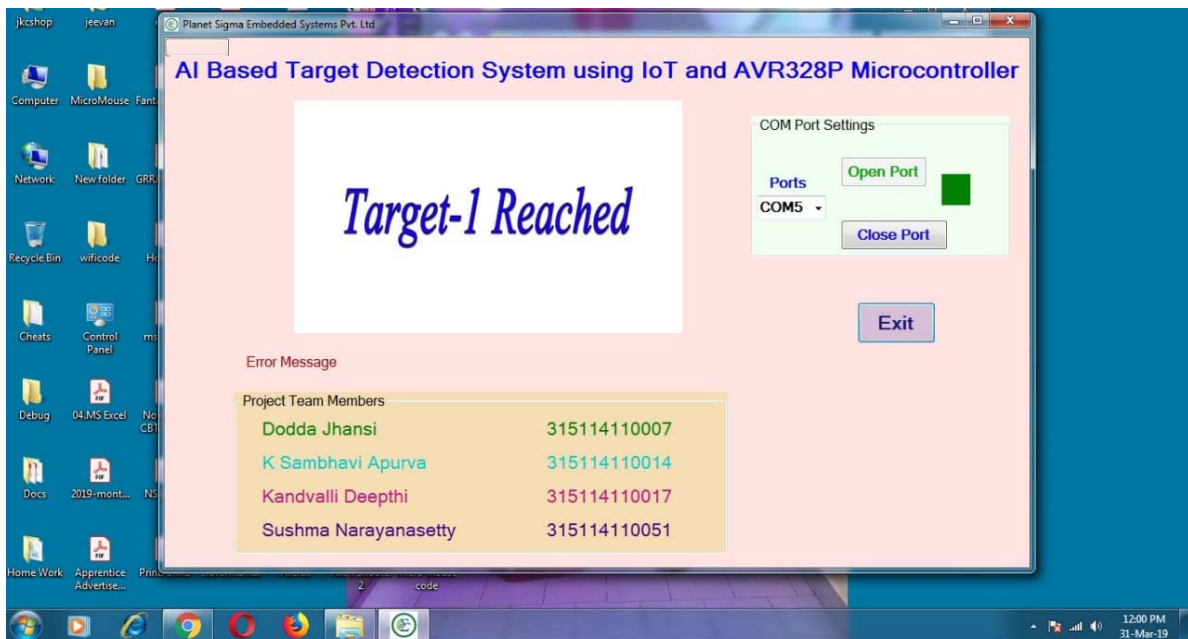


Figure 3. Output Screen 1

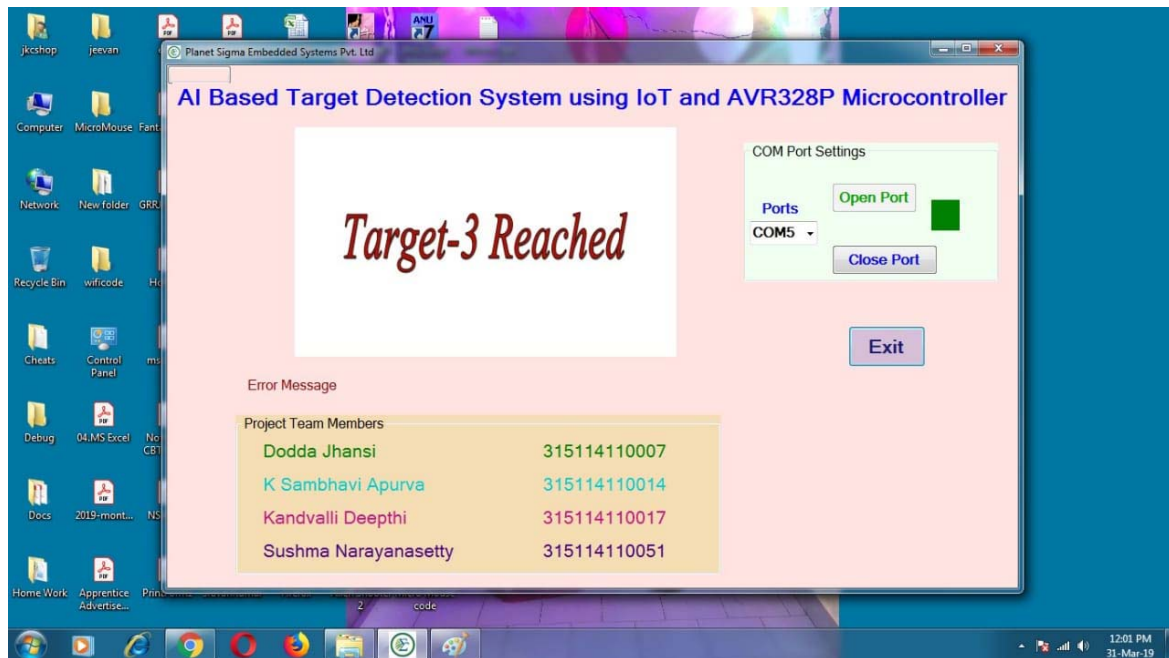


Figure 4. Output Screen 2

V. CONCLUSION

Robots are predicted to be the future. And adding sensors to the robots can help us in making certain simple tasks even simpler such that we may need not control or operate them anymore. The “**Artificially Intelligent Robot with Microcontroller, Object Detection, Black & White Sensors (AIROB)**” is one such evolution which is used to identify a path between given two points and reach the destination without any human help except for selecting the desired target. The main goal of this project, **AIROB** is to reduce human intervention in simple tasks like identifying a path and transporting goods to the destination. Here **AIROB** uses 5 object sensors to sense the obstacles in all directions acquiring 360° detection capacity. **AIROB** provides a cost-efficient method of designing this robot using a simple design. This not only reduces the robot cost but also minimizes the human labour for both small- and large-scale business. It increases the efficiency of work as it uses artificial intelligence which reduces the human errors when the work is carried out by humans.

VI. REFERENCES

References for the project development were taken from the following books:

Books:

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