

AUTOMATIC MOVING TROLLEY FOR A WAREHOUSE THROUGH PICK AND PLACE MECHANISM

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Abstract - This paper presents an automatic trolley used to pick small boxes and place it to desired place. The motive of the trolley system is combined with pick and place arm for retrieval of objects. The system incorporates a line follower circuit, gripper to pick and place the boxes, and a barcode scanner, ATMEGA 16 AVR microcontroller, Wi-Fi module ESP8266. Line follower will track black lines using IR modules. It consists of a bar code scanner which will scan the bar code placed on every box. All the bar code will be stored in controller memory and the trolley itself will move to the desired location when Wi-Fi module will receive the list of components to be brought from the server and then Wi-Fi module will get disconnected and barcode scanner will get connected with UART and will scan the bar code available on the box and decode it. After decoding it will bring the required box to the required location. It will hold the box using gripper where the IR sensor will sense whether the robot has picked the box or not. Once the sensor has sensed the object it will place the object in the trolley and will follow its track and come back to its location. It is used to pick small electronic boxes in warehouse. As it consists of only one UART DPDT relay will be used to switch between Wi-Fi module and a barcode scanner. This project would be useful to any warehouse using electronic components for their manufacture.

Key Words: Barcode Scanner, ATMEGA16 AVR, Wi-Fi Module.

1. INTRODUCTION

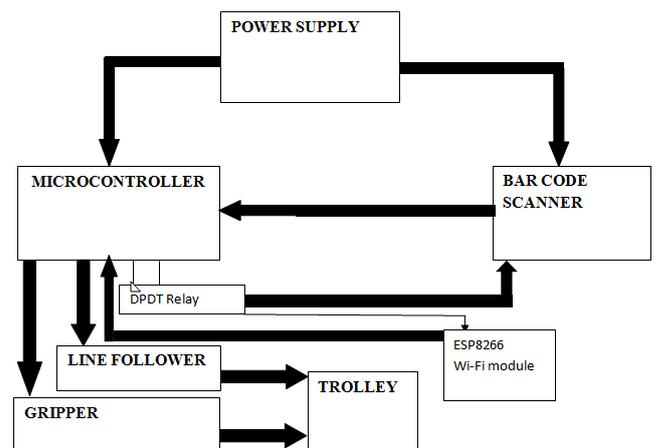
An automatic trolley is used to pick small boxes and place into the trolley with the help of gripper. As it is automatic it will bring the required boxes as programmed. It basically comprises of: A line follower circuit, Gripper to pick and place the boxes, A bar code scanner ATMEGA 16, A basic power supply circuit, LCD 16x2, IR modules and lastly for wireless input ESP8266EX. The system in this case is deployed to pick small component boxes in a warehouse. The line follower is a self-operating robot that detects and follows a line that is drawn on the floor. The path consists of a black line on a white surface (or reverse) which is integrated with a control system used to maneuver the robot yet effective provide a closed loop system. All the component boxes which are present in the warehouse are to be provided with programmed barcodes. Barcode is an old technology deployed yet it is primarily effective as every product has a barcode which can be generated as and when required. These barcodes require a line of sight in order to get

recognized easily. List of components are provided to ATMEGA 16 through ESP 8266 (Wi-Fi module). Wi-Fi module is configured as a client and system as a main server. Main server will keep a track of available components. There are certain issues faced in warehouse as specified below:

- Warehouse manufacturing area is quite compact due to which frequent movement of workers become difficult leading to more time consumption and inefficiency.

In order to overcome this issue, we have implemented this automatic trolley.

2. BLOCK DIAGRAM



It consists of ATMEGA16 AVR Microcontroller, a barcode scanner, line follower, gripper, ESP 8266 Wi-Fi module. In this Wi-Fi module acts as a client and system acts as server. The data list will be present in system (server) and the server will send the data to the controller through Wi-Fi module. Controller will send commands to DPDT Relay, according to the requirement Barcode scanner and Wi-Fi module will be selected. Gripper will pick the desired object and place it in the trolley.

3. HARDWARE USED

3.1 Atmega 16

ATMEGA 16 is an 8-bit high performance microcontroller from the Atmel's Mega AVR family. ATMEGA 16 is a 40-pin microcontroller based on enhanced RISC (Reduced

Instruction Set Computing) architecture with 131 powerful instruction. It has a 16KB programmable flash memory, static RAM of 1KB and EEPROM of 512 bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. Most of the instructions execute in one machine cycle. It can work on a maximum frequency of 16MHz. ATMEGA 16 pin diagram should clarify things a bit.

3.2 Bar Code Scanner

A barcode reader (or barcode scanner) is an electronic device that can read and output printed barcodes to a computer. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain decoder circuitry analyzing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port.

3.3 IR Module

IR sensor is very popular sensor, which is used in many applications in electronics, like it is used in Remote control system, motion detector, Product counter, Line follower Robots, Alarms etc. IR sensor basically consist an IR LED and a Photodiode, this pair is generally called IR pair or Photo coupler. IR sensor work on the principal in which IR LED emits IR radiation and Photodiode sense that IR radiation. Photodiode resistance changes according to the amount of IR radiation falling on it, hence the voltage drop across it also changes and by using the voltage comparator (like LM358) we can sense the voltage change and generate the output accordingly.

3.4 ESP8266

ESP8266EX is among the most integrated Wi-Fi chip in the industry. It integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs

4. SOFTWARE DESCRIPTION

MikroC Pro AVR

The mikroC PRO for AVR is a powerful, feature-rich development tool for AVR microcontrollers. It is designed to provide the programmer with the easiest possible solution to developing applications for embedded systems, without compromising performance or control.

5. TECHNIQUE USED

5.1 Barcode Detection

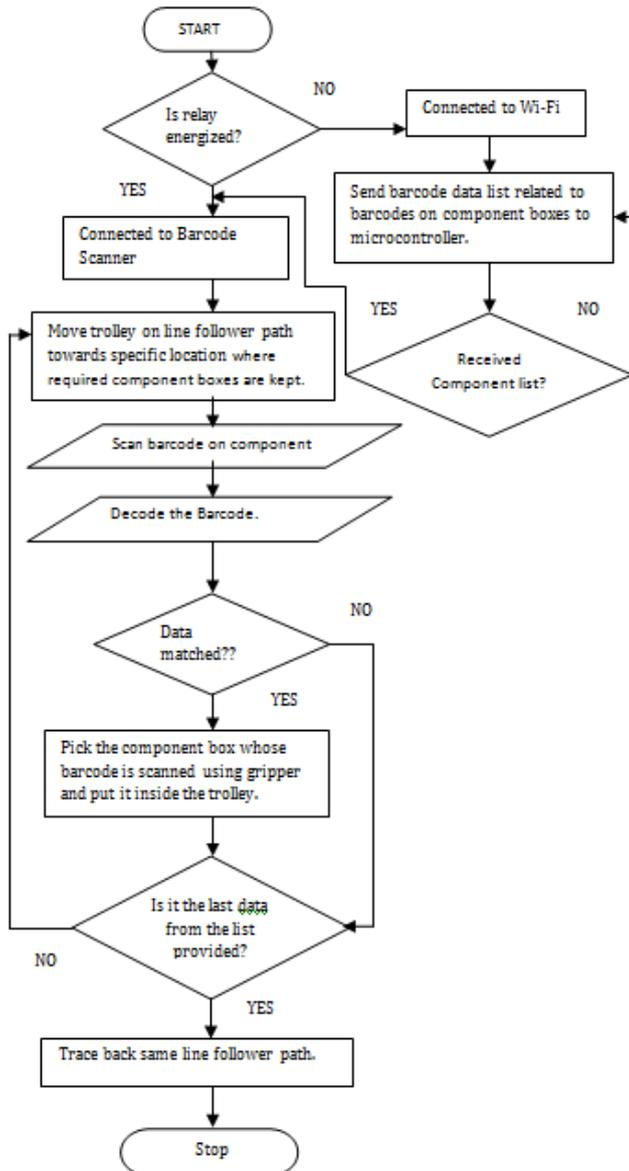
Barcodes showed data by varying the widths and spacing of parallel lines, they would evolve into a number of geometric patterns in two dimensions. Barcode scanner will scan the barcodes available on the component boxes. This information will be sent to barcode decoder and decoded information in the form of 0's and 1's will be send to ATMEGA16. In code data will be transmitted in main program and data will be received as soon as the interrupt comes. The first alphabet of all 5 Barcodes are kept different so that it can be easily identified. Case statements are used to select the required Barcodes. Data is not send as complete string but it is send bit by bit. Scanned barcodes are send to ATMEGA16 and data from the server is sent to controller through Wi-Fi module is saved in its memory. Both the data are compared and is given to the line follower to bring the required components.

6. OPERATION OF SYSTEM

- This system is basically designed to help the workers in warehouses where there is less availability of space and movement is very frequent.
- When the workers need any component, they will give command from the main system.
- The list of components will be stored in the main system and the worker will just select the list of components and send it to the controller through Wi-Fi module.
- DPDT Relay is connected to the controller to give the proper switching between Barcode Scanner and Wi-Fi module as there is only one UART.
- For normally close connection Wi-Fi module is connected and for normally open connection Barcode Scanner is connected.
- As soon as the list of components are provided to the controller the signal will be send to line follower unit.
- The line follower will move as per the guided lines, it will trace all the black lines.
- As the line follower reaches the bin where the components are kept, the Barcode Scanner is mounted over the gripper.
- The gripper will move to scan the Barcode present on the component boxes.
- Then the scanned Barcode will be matched with the stored barcodes (first bits of each barcodes).
- As soon as the scanned barcodes matches with the stored barcode the gripper will pick the component box.
- In the openings of the gripper there is IR module connected to monitor that the box is held by the gripper.

- The gripper will pick the box and place it in the trolley and move to the destination.

7. FLOWCHART



8. ADVANTAGES

- It reduces manpower
- saves time
- easy to handle in daily operations
- avoids human error

9. APPLICATION

- Used in warehouses
- Places where there is less space

10. CONCLUSION & FUTURE SCOPE

- Building a real time system just to keep a continuous check on availability of components. So that even when the trolley has started to move on its path if certain components is taken from the bin or suddenly there is no availability of components immediately microcontroller will get signal and trolley will trace its path back at whichever place it is.
- Also, it can be further modified to be used at supermarkets and malls.

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