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Pick and Place Robot

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ABSTRACT

Abstract : The report presents a smart approach for a real time inspection and selection of objects. Image processing in today's world grabs massive attentions as it leads to possibilities of broaden application in many fields of high technology. The real challenge is how to improve existing sorting system in the modular processing system which consists of four integrated stations of identification, processing, selection and sorting with a new image processing feature. This report presents a mechatronics color sorting system solution with the application of image processing. Image processing procedure senses the objects in an image captured in real-time by a webcam and then identifies color and information out of it. This information is processed by image processing for pick-and-place mechanism. The microcontroller sends signal to circuit which drives the various motors of the robotic arm to grip the object and place it in the specified location. Based upon the detection, the robotic arm moves to the specified location, releases the object.

Keywords - ATMEGA16, ZIGBEE ,RISC- Reduced instruction set for computing, MAX 232 Links, camera

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I. INTRODUCTION

The paper presents a smart approach for a real time inspection and selection of objects in continuous flow. Image processing in today's world grabs massive attentions as it leads to possibilities of broaden application in many fields of high technology. The real challenge is how to improve existing sorting system in the modular processing system which consists of four integrated stations of identification, processing, selection and sorting with a new image processing feature. Existing sorting method uses a set of inductive, capacitive and optical sensors do differentiate object color. This paper presents a mechatronics color sorting system solution with the application of image processing. Image processing procedure senses the objects in an image captured in real-time by a webcam and then identifies color and information out of it. This information is processed by image processing for pick-and-place mechanism. The Seminar deals with an automated material handling system. It aims in classifying the colored objects by color, size, which are coming on the conveyor by picking and placing the objects in its respective pre-programmed place. Thereby eliminating the monotonous work done by human, achieving accuracy and speed in the work. [1][2]

Smart Color Sorting Robot is based on a placing system with some capability to place the object according to their color. The object will be defined by determining color of the ball while the system will figure out which location the object should be located. With the PIC as a controller for the system, a manually feed object which is a coloring ball will be determined by the robot to take and eject them to their exact location or station. In this Seminar a line follower will brought the ball that will be sense by LDR sensor to right station. A main part in this Seminar is an LDR sensor which is used to detect light. Capability of this system to detect the type of this object and it will be chosen based on their color. There are four stations in the Color Sorter system that we made. Each station had their own range of color except for the first station which is the load and unloading station.[7]

In this paper, a robotics application is pointed out as an example of smart system where a robotic arm is driven by means of a webcam for catching a cubic box with a tag glued on its basis. Subsequently, the arm moves the box to a Reader and it identifies the object by the received information from the tag. Depending on this information, the robotic arm can take the cubic box to a deposit point or

to another one in its working space. This is an example of integration between the camera feedback and the RFID technology for automatic sorting of boxes. There is to consider that the moved objects have the same shape so that the robot cannot make out their features by the webcam. The robotic arm was suitably driven by instruction packets sent to servo-controller after solving the inverse kinematic problem. [4]

II. DESIGN CONSIDARATION

A. ZIGBEE

ZigBee is a IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power radios. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer. Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking (ZigBee networks are secured by 128 bit symmetric encryption keys.) ZigBee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device.

B. DC MOTOR

DC motors are used to physically drive the application as per the requirement provided in software. The dc motor works on 12v.To drive a dc motor, we need a dc motor driver called L293D. This dc motor driver is capable of driving 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit. We can also provide the back EMF protection suit by connecting 4 diode configurations across each dc motor.Servos are DC motors with built in gearing and feedback control loop circuitry. And no motor drivers required. A servomotor is a rotary actuator that allows for precise control of angular position. They consist of a motor coupled to a sensor for position feedback, through a reduction gearbox. They also require a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing. . The servo motor has some control circuits and a potentiometer (a variable resistor) that is connected to the output shaft. This pot allows the control circuitry to monitor the current angle of the servo motor. If the shaft is at the correct angle, then the motor shuts off. If the circuit finds that the angle is not correct, it will turn the motor the correct direction until the angle is correct. The output shaft of the servo is capable of traveling somewhere around 180 degrees. Usually, its somewhere in the 210 degree range, but it varies by manufacturer. A normal servo is used to control an angular motion of between 0 and 180 degrees. A normal servo is mechanically not capable of turning any farther due to a mechanical stop built on to the main output gear. A amount of power applied to the motor is proportional to the distance it needs to travel. So, if the shaft needs to turn a large distance, the motor will run at full speed. If it needs to turn only a small amount, the motor will run at a slower speed.

C. ATMEGA 16

High-performance, Low-power AVR 8-bit Microcontroller
- Advanced RISC Architecture
- 131 Instructions - Most Single Clock Cycle Execution
- 32 x 8 General Purpose Working Registers
- Up to 16 MIPS Throughput at 16MHz
- Fully Static Operation
- On-chip 2-cycle Multiplier
- Non-Volatile Program and Data Memories
- 16k Bytes of In-System Self-Programmable Flash
- Optional Boot Code Section with Independent Lock Bits
- 512 Bytes EEPROM
- Programming Lock for Software Security
- JTAG Interface
- Boundary-scan Capabilities According to the JTAG Standard
- Extensive On-chip Debug Support
- Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface
- Peripheral Features
- On-chip Analog Comparator
- Programmable Watchdog Timer with Separate On-chip Oscillator
- Master/Slave SPI Serial Interface
- Two 8-bit Timer/Counters with Separate Prescaler, Compare
- One 16-bit Timer/Counter with Separate Prescaler, Compare and Capture mode
- Real Time Counter with Separate Oscillator
- Four PWM Channels
- Programmable Serial USART
- 8-channel, 10-bit ADC
- Byte-oriented Two-wire Serial Interface
- Special Microcontroller Features
- Power-on Reset and Programmable Brown-out Detection
- Internal Calibrated RC Oscillator
- External and Internal Interrupt Sources
- Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- I/O and Packages
- 32 Programmable I/O Lines
- 40-pin PDIP, 44-lead TQFP, and 44-pad MLF
- Operating Voltages
- 4.5-5.5V for ATmega16
- Speed Grades
- 0-16MHz for ATmega16
- Power Consumption at 4 MHz, 3V, 35 °C
- Active: 1.1mA
- Idle Mode: 0.35mA
- Power-down Mode: < 1µA

Robotic Arms operated by Servomotors

Arms are types of jointed robot manipulator that allow robots to interact with their environment. Many have onboard controllers or translators to simplify communication, though they may be controlled directly or in any number of ways.

III.BLOCK DIAGRAM

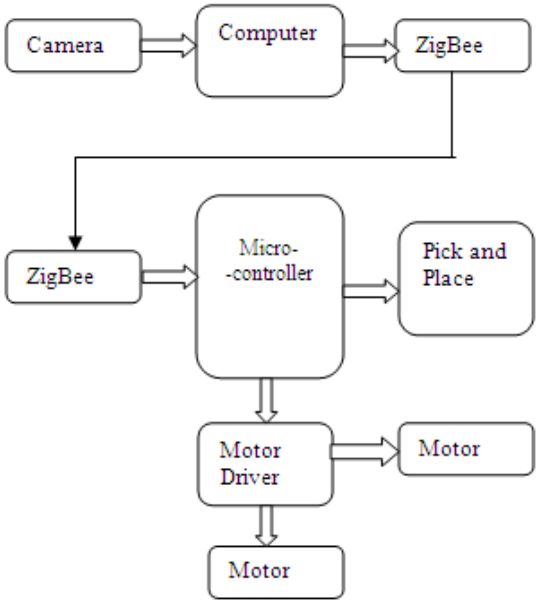

Fig.3.1 Block Diagram

IV.WORKING

A) In this Seminar camera will be used as input sensor, camera is above your head camera which will be mount on PC, and will be coupled to PC by USB. The camera will take a spontaneous and it will feed to PC for color processing. In PC matlab is used for processing on the color, depending on this signal will be given to microcontroller At-mega 16. The microcontroller in turn will manage the servomotors by PWM signal. These servomotors will control the movement of robotic arm, by controlling their angular movement. Thus the robotic arm will be fully controlled by servomotors. The gripper of robotic arm will select the item place it depending on its dimension. This will full automatic method no physical support is wanted.

Recognition of the object position will be assured by a suitable toolbox after tuning and focusing the webcam. A reference system transformation (rotation and translation) is necessary to transform the object center coordinates (xv,yv) in the coordinates with respect to the robotic arm reference system O(x,y).

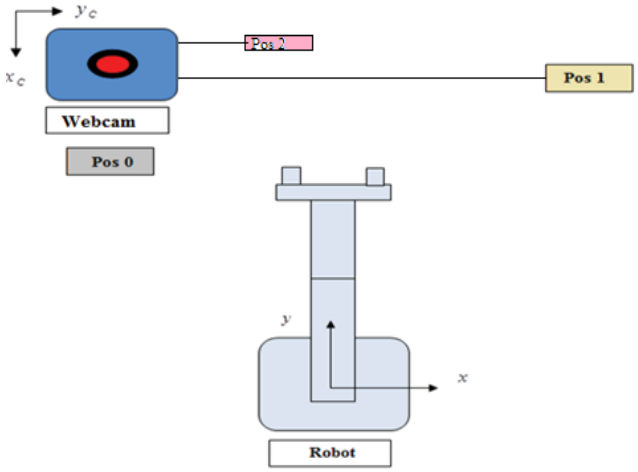

Fig.4.1 Working of System.

V. CONCLUSION

The microcontroller sends signal to circuit which drives the various motors of the robotic arm to grip the object and place it in the specified location. Based upon the detection, the robotic arm moves to the specified location.

The proposed application may be considered for efficient and economic solid waste collection as well as for sorting.

REFERENCES

1. Mr. Deepak L RAJNOR&A.S Bhide "Automatic Material Handling System Using Pick & Place Robotic Arm & Image Processing "IJSRD - International Journal for Scientific Research & Development| Vol. 2, Issue 05, 2014 | ISSN (online): 2321-0613
2. Alessandro Golfarelli, Rossano Codeluppi and Marco Tartagni, " A Self-Learning Multi-Sensing Selection Process: Measuring Objects One by One by",ARCES – LYRAS LAB University of Bologna, Campus of Forlì, 1-4244-1262-5/07/$25.00 ©2007 IEEE, IEEE SENSORS 2007 Conference.
3. Afrisal, H.Faris, M. ; Utomo, G.P. ; Grezelda, L. ; Soesanti, I. ; Andri, M.F. " Portable smart sorting and grading machine for fruits using computer vision "by Dept. of Electr. Eng. & Inf. Technol., Univ. GadjahMada, Yogyakarta, Indonesia IEEE 19-21 Nov. 2013, Jakarta
4. N.I. Giannoccaro, L. Spedicato, A. Lay-Ekuakille"A SMART ROBOTIC ARM FOR AUTOMATIC SORTING OF OBJECTSWITHDIFFERENT TAGS"Department of Innovation Engineering, University of Salento, Lecce, Italy, ivan.giannoccaro@unisalento.it June 3-4, 2013, Lecce, Italy.
5. Szabo, R.&Lie, I. "Automated colored object sorting application for robotic arms" Electronics and Telecommunications (ISETC), 2012 10th International Symposium , 10.1109/ISETC.2012.6408119,2012 IEEE Conference Publications.

6)http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6121543&newsearch=true&queryText=smart%20sorting%20robot

7)http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CBwQFjAAahUKEwjRj6qDzrTIAhXEH44KHZLWAow&url=http%3A%2F%2Feprints2.utem.edu.my%2F3047%2F1%2Fsmart_color_sorting_robot__24_pages.pdf&usg=AFQjCNH1d5bHqa_90pJJO9YrdwgIDGvUSA&bvm=bv.104615367,d.c2E.

