Gesture Controlled Robot Using Image Processing

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Abstract: Recent gesture controlled robots operates with humans next to them. Whereas, our project deals with interface of robots through gesture controlled technique but far away from the user. This can be achieved through image processing technique. The command signals are generated from these gestures using image processing. These signals are then passed to the robot to navigate it in the specified direction.

KEYWORDS: Halide, PIC18 Microcontroller, MRF24WG0MA/ MRF24WG0MB, L293D: Motor Driver

I.INTRODUCTION

Nowadays, automation has become a most desirable means of operating a device. The word which comes to our mind when we say "automation" is "ROBOTICS". Robotics plays a vital role in our society. Many undergoing projects are about robotics since, they reduce man power. Some of the robotic projects are also used for even crucial tasks which may harm the life of mankind. In early days, for operation of robots a person should be physically present beside it for operation. Our paper is about to operate a bot which may not be near us and could be operated from a station. How this is made possible? This can be executed through a technique called IMAGE PROCESSING. That is we can operate the bot from a base station by means of hand gesture. The hand gesture is received by the robot and it operates accordingly.

II.TECHNOLOGIES USED

- Halide
- PIC18 Microcontroller
- MRF24WG0MA/ MRF24WG0MB
- L293D: Motor Driver

III.DESIGN

3.1PIC18 MICROCONTROLLER

Microcontroller is considered as the heart of our project. It sends various instructions to the whole system for desired action. Here we use PIC18 Microcontroller which can easily interface with the Wi-Fi module which we have chosen.

The unique features of the micro-controller are:

- 83 (16-bit wide)
- Up to 2 MB addressable program memory
- 4KB RAM (max)

- 32 level hardware stack
- 1 (8-bit) file select register
- Integrated 8x8 hardware multiply
- Highest performance 8-bit architecture
- Low power consumption

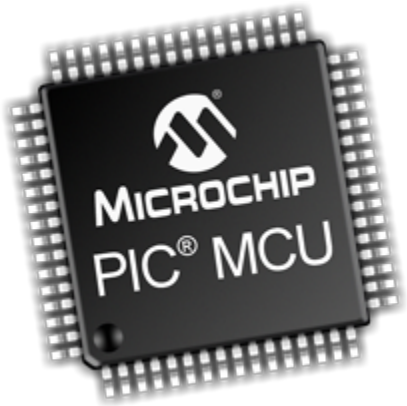

Figure 1: PIC Micro-controller chip

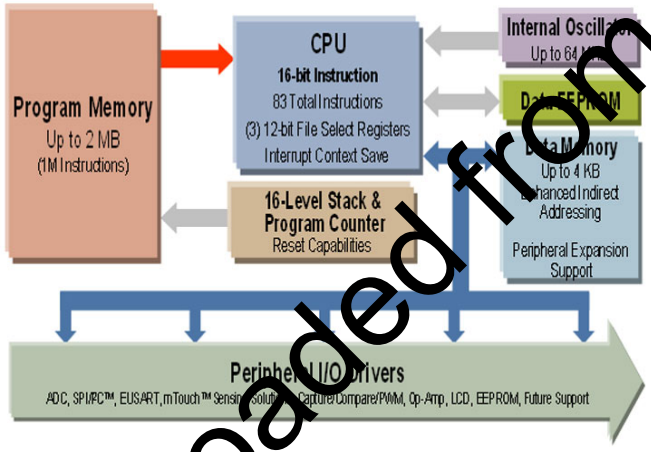

Figure 2: PIC16 Architecture Block Diagram

3.2 .MRF24WG0MA/ MRF24WG0MB

The MRF Module connects to hundreds of PICmicrocontrollers via a 4-wire SPI interface and interrupt and is an ideal solution for lower-power, low data-rate Wi-Fi® sensor networks, home automation, building automation and consumer applications. The combination of the module and a PIC MCU running the TCP/IP stack results in support for IEEE Standard 802.11 and IP services. This allows for the immediate implementation of a wireless web server.

Figure 3: MRF24WG0MA

3.3. HALIDE

Halide is a new programming language designed to make it easier to write high-performance image processing code on modern machines. Its current front end is embedded in C++. Compiler targets include x86/SSE, ARM v7/NEON, CUDA, Native Client, and OpenCL

3.4. L293D: MOTOR DRIVER

It takes digital signal as an input fromthePIC Micro-controlleranditgives digital output to the DC motors of the robot. Power supply to the circuit is given by rechargeable batteries. In this system some rechargeable mobile batteries are used as power supply each of 3.7V. To provide more voltage to drive the motors, 2-3 such batteries are connected in series.

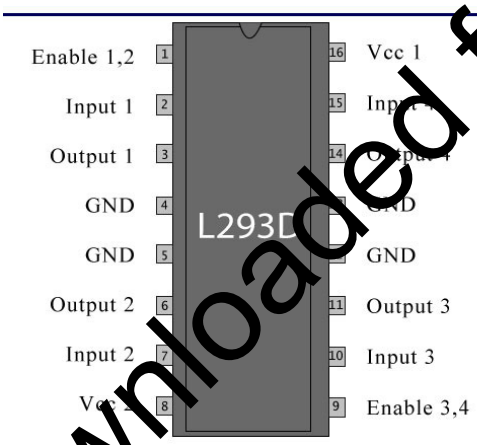

Figure 4: L293D motordriver

IV. IMPLEMENTATION

The user is present at a station far from the location of the bot from which he operates the robot. The user uses a webcam through a PC or Laptop to perform this process. He waves his hand upwards, downwards, left or right. The robot navigates following the hand gesture. This is the basic operation of our system. The detailed working of our system is discussed below.

- The webcam captures the video stream of the hand gestures in real time environment. The hand gestures are recorded and sent as a generated signal through a Wi-Fi from the station to the Wi-Fi module present in the robot. Therefore, Wi-Fi acts as a channel for transmission of signals.

- Two ways of recording the hand gestures are followed namely, a) Finger Count method b) Hand Palm technique

- The efficiently used method is hand palm technique since; finger count method does not provide required depth in output.
- The Wi-Fi signal is received by the module in the system i.e, MRF24WG0MA. It works at standard IEEE range 802.11. It sends the received signal from the station to the micro-controller.

- The program fed to the micro-controller is HALIDE. This is the most efficiently used programming languages for image processing.

- The micro-controller sends the command to the whole system proportional to the signal received. The micro-controller performs image thresholdingand performs the operations. Later, the signal is converted to digital signal.

- Finally the processed signal is sent as a command to the motor driver. The motor driver facilitates the navigation of the robot to happen. Unless, the gesture is changed by the user, the robot continues moves in the previous direction.

Figure 5: Input image

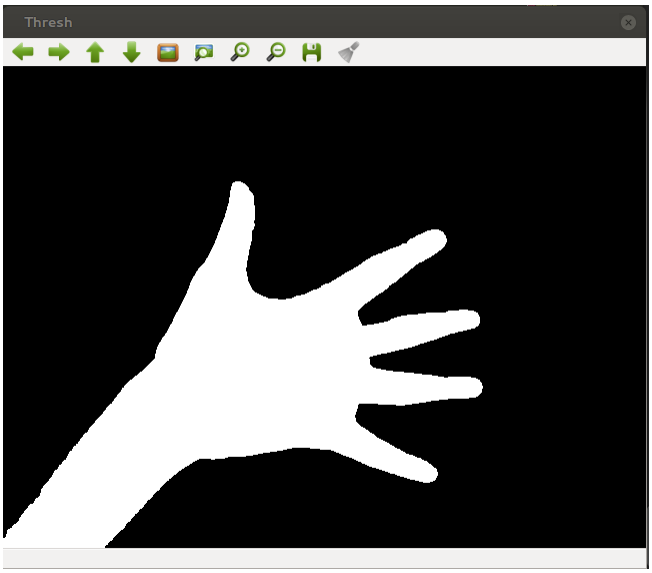

Figure 6: Threshold image

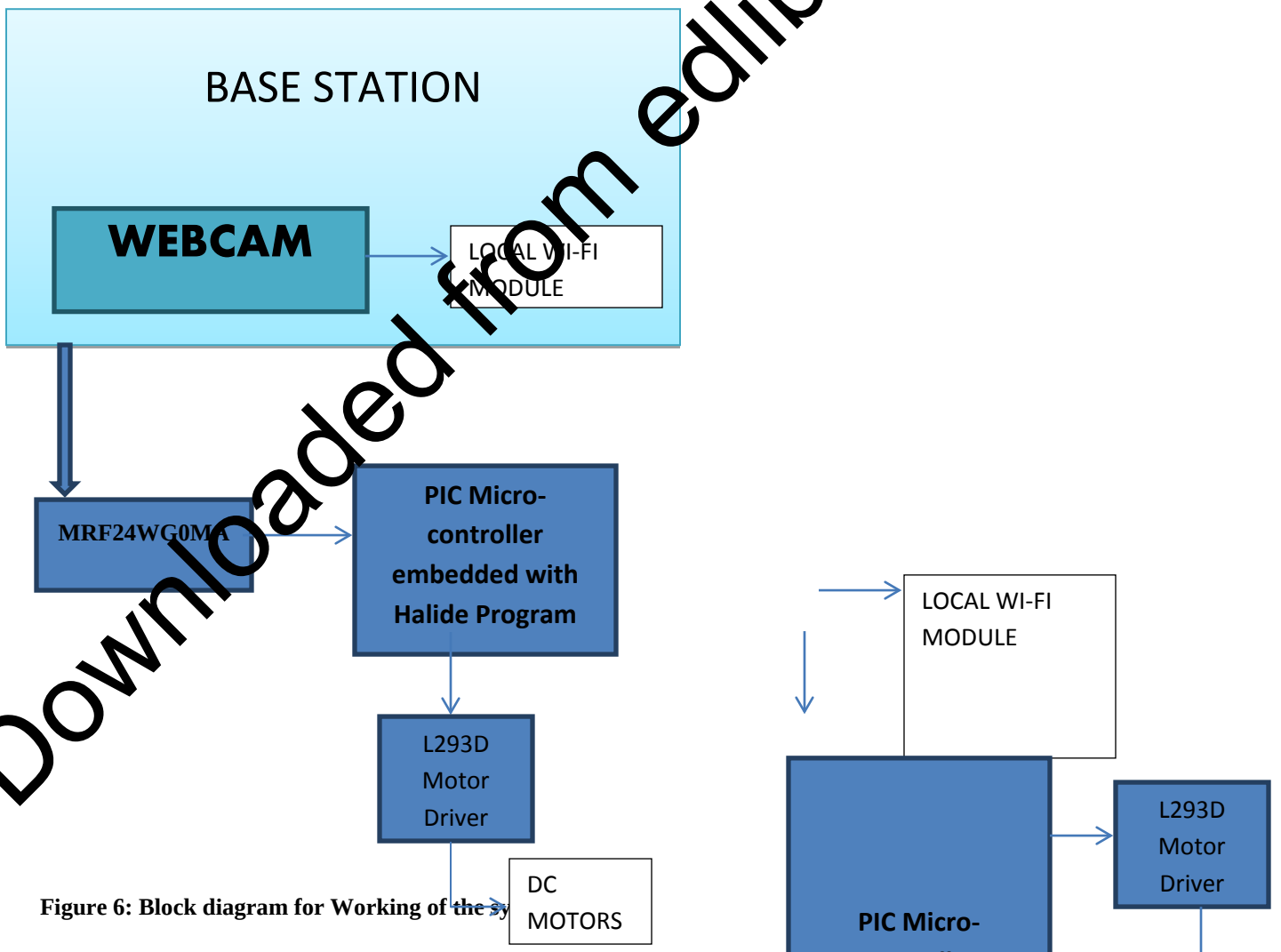

Figure 6: Block diagram for Working of the sy

CONCLUSION

The Gesture Controlled Robot System gives an alternative way of controlling robots. Gesture control being a more natural way of controlling devices makes control of robots more efficient and easy. This paper adds s special feature that this gesture controlled robot can be operated from a considerably far off place through hand gestures. Hence it reduces the chances of danger for human life in crucial areas. Application wise, this robot can be for defense purpose.

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