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Designing of Cleaning Robot

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Abstract: - Automatic work is taken over the robot technology and many of the related robot appliances are being used extensively also. Here represents the technology that proposed the working of robot for Floor cleaning. All hardware operations are controlled by ARM7 LPC2138, LCD(16X2), DC Motor Driver(L293D), DC Motor and Keys. All software operations are controlled by KEIL-3, PROTEUS, MATLAB and Flash magic. This robot can perform brooming task. We have used car vacuum cleaner whose range is 12V. This robot is incorporated with IR sensor for obstacle detection. We have used two motor drive so that we can drive four motor at a time. In the automatic mode robot control all the operations itself and change the lane in case of hurdle detection and changes the path in 90 degree. For saving time we needed an automatic system that cleans on its own without human interventions. The keys are used to perform expected task of two different rooms. The whole circuitry is connected to 12V supply.

Keywords: - ARM7, Scanning and identifying keys, DC motors

I. INTRODUCTION

Now a day, people live a much busy life. People in metros have irregular and long working times. In such situations a person will always find ways of saving time. Household works are the ones that are most dreaded upon and cleaning a home tops the list. It is time consuming as well as very tiring. Especially for women's who do office work, it becomes difficult to handle both, home and office work together. She is required to do the household work in the morning, go to office and do the work there and return home in the eve to again start her chores at home. Thus she lives a dual life. In such case, we thought of gifting her away of saving some of her precious time. Hence the concept of House Cleaning Robot comes into picture. For saving time we need an automatic system that cleans floor and ceiling on its own without human efforts. Also, we did think about how to help people with physical disabilities. Since we had to do this, we knew that we needed a cleaning system that works in accordance to what we say, thus helping a physically disabled person.

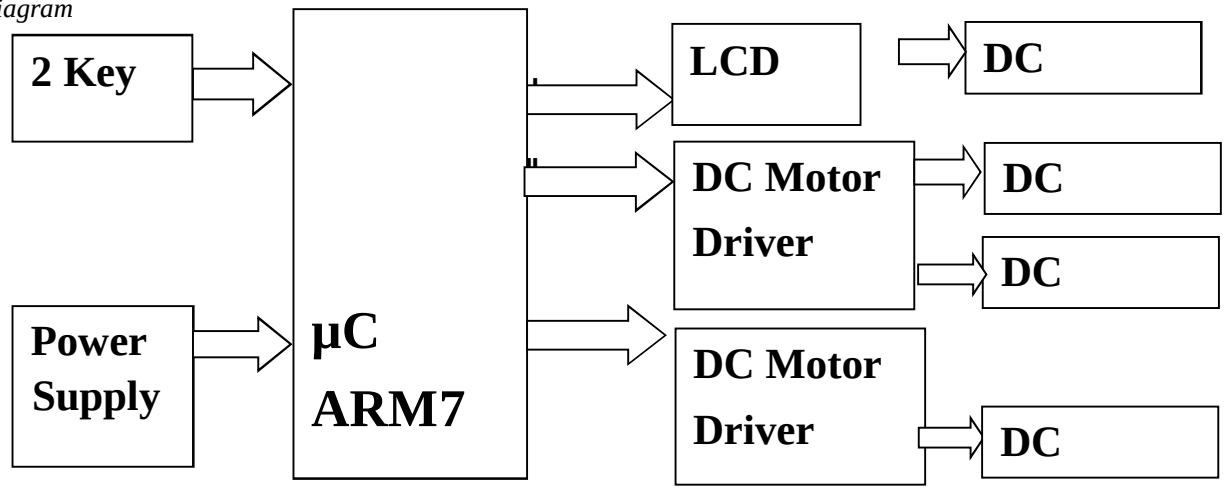
II. OBJECTIVE

Easy to clean the floor and ceiling, Easy to handle, Diminution of work and time.

III. WORKING PRINCIPLE

The home cleaning robot uses microcontroller to check path and manipulates its direction as per the inputs from microcontroller. The heart of the system is a microcontroller. The robot follows the different path and cleans the room. Two keys are given for two rooms. The vacuum cleaner mounted on the robot does the cleaning process.

A. Block Diagram



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B. Microcontroller

Microcontroller ARM-7 has flash memory. The programming of this microcontroller is very easy. It is used to interface with all interfaces as per their application.

C. ARM 7

This generation introduced the Thumb 16-bit instruction set providing the enhanced code density compared to previous designs. Mostly used ARM7 designed to implement the architecture of ARMv4T, but some implement the architecture of ARMv3 or ARMv5TEJ. Each of these designs use the Von Neumann architecture, hence the few versions which has cache do not separate data & also the instruction caches.

Some ARM7 cores are no longer in use. The model of ARM7DI is significant and it is notable for having introduced the JTAG based on-chip debugging, while the later ARM6 cores did not support it. In ARM7DI the letter "D" represents the JTAG TAP for debugging, while "I" denotes the Ice Breaker debug module which supports the hardware breakpoints and watchpoints, and letting the system to be paused for debugging. Subsequent cores which are included and improved this support.

It is a different processor which is designed for mobile devices and also other low power electronics component. The architecture of the processor is capable of up to 130 MIPS on a typical 0.13 µm process. The ARM7TDMI processor core implements the ARM architecture v4T. Both 32-bit as well as 16-bit instructions are supported by the processor via the ARM and Thumb instruction sets.

The ARM7TDMI (ARM7+16 bit Thumb+j tag Debug+fast Multiplier+enhanced ICE) processor is 32-bit RISC CPU designed by ARM, & licensed for manufacture by an array of semiconductor industries. In the year 2009 it remained one of the most widely used ARM cores, & is found in numerous embedded system designs. The synthesizable core is ARM7TDMI-S variant.

D. Liquid Crystal Display

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD.

LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

E. Scanning and Identifying the Key

The output ports are connected to the rows and while the input ports are connected to the column. When no key has been pressed, reading the input port will give 1s for every column since they all are connected to high voltage (VCC). If all rows are grounded & a key is pressed, one of the columns will have 0 since the key pressed provides a path to ground. It is the functions of the microcontroller to scan the keyboard continuously detect and identify the key pressed.

To detect the key pressed, the microcontroller will ground all rows by providing ZERO to the output latch, and then it will read the column. If the data read from the columns D3 to D0 =1111, no key has been pressed and the process continues until & unless a key pressed is detected. However, if one of the column bits has a ZERO, this means that a key press has occurred. for eg. If D3 to D0 = 1101, this means that a key in the D1 column has been pressed. After the key press is detected, the microcontroller will automatically go through a process of identification of the key, starting with the first row, the microcontroller then grounds it by providing a low to D0 only then it will read the columns, the data read is all 1's , no key in that row is activated and the process is moved to the next row. It grounds the next row, reads the columns, and checks for any 0 this process continues until the row is identified. Later the identification of the row in which the key has been pressed, the next task is to find out the pressed key of the column.

F. 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.

G. DC Motor Driver (L293D)

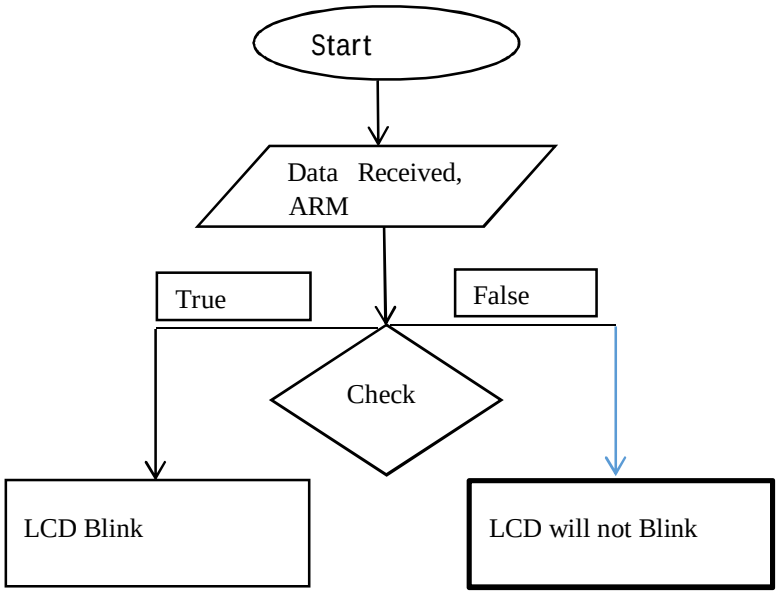
This Device is a monolithic integrated with high voltage, high current 4 channel driver designed to accept the standard DTL or TTL logic levels & drive inductive loads (such as relays, solenoids, DC & Stepping motors) and power transistors. To simplify the use as

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two bridges, each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing the operation at lower voltage & internal clamp diodes are included. This device is suitable for the best use in switching applications at frequencies upto 5 kHz. The assembling of L293D is done in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking The L293D is assembled in 20 lead surface mount which has 8 mid pins connected together and are used for heat sinking.

IV. ALGORITHM



V. ADVANTAGES

A. Highly flexible
B. Quick response time
C. Fully automate system thus Reduces human efforts
D. Robust system
E. Less Corruption
F. Increased corruption in the Govt. As well as market sector can be prevented if system becomes automated
G. Increased adulteration in consumables can be prevented
H. Cost effective approach
I. Time saving approach

VI. APPLICATION

A. Can be used in home, industry.
B. Can be used for physical handicapped person.

VII. CONCLUSION

This is an advanced technology to clean the floor as well as ceiling using ARM processor. In the present era, Humans live a busy life. People in metros have irregular as well as long working hours. In such situations, a person will always find ways for saving time. Hence this cleaning robot will clean the floor and ceiling automatically.

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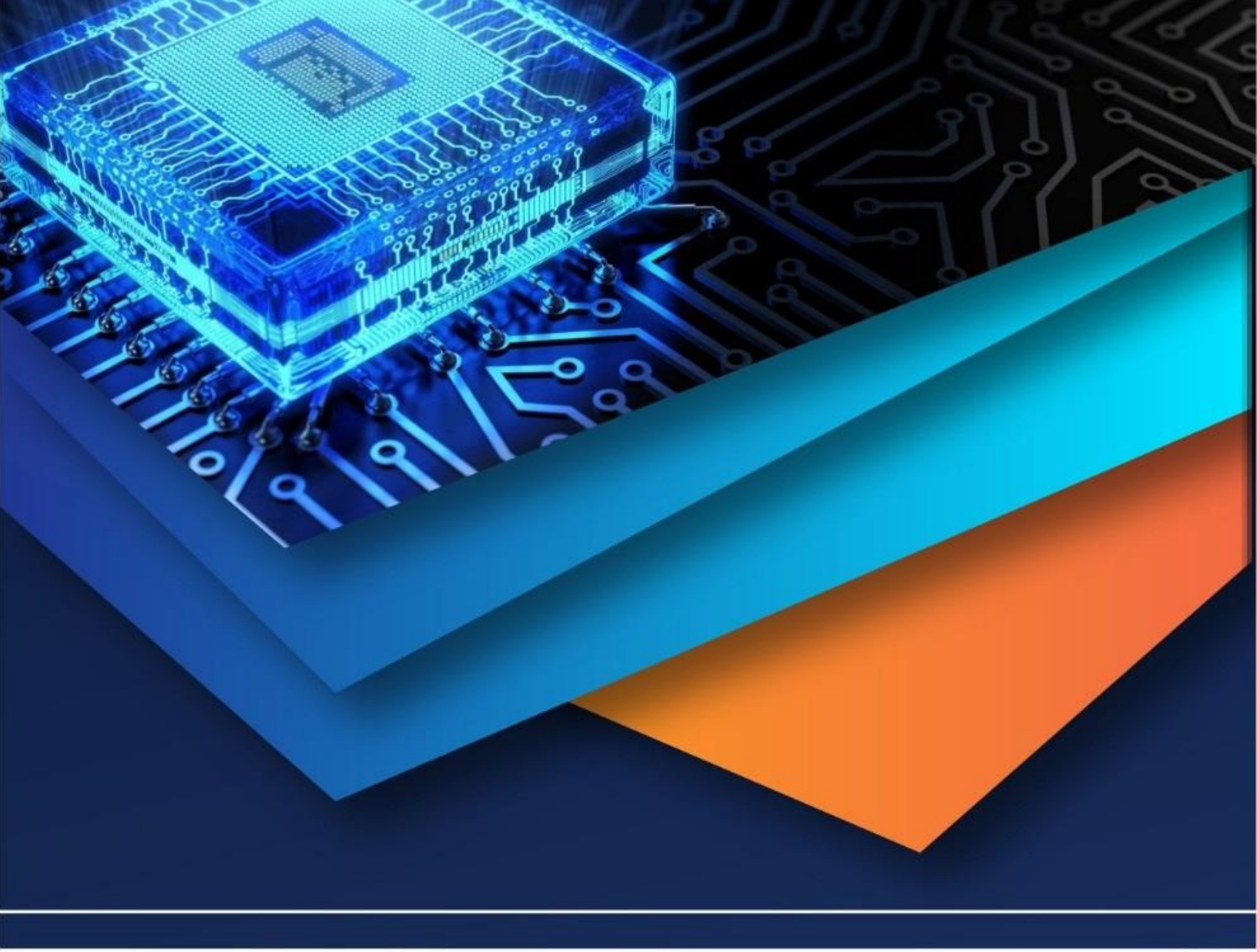
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