FABRICATION OF A DIJKSTRA ALGORITHM BASED ROBOT

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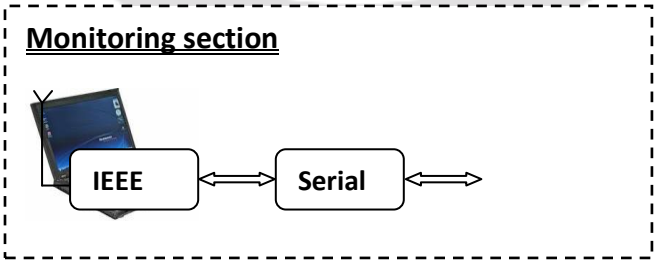
ABSTRACT

Fabrication of a robot on DIJKSTRA'S algorithm based architecture designed for the purpose of finding the shortest path between the nodes in vehicle navigation. Dijkstra's algorithm is a graph search algorithm that solves the single-source shortest path problem for a graph with non-negative edge path costs, producing a shortest path tree. For a given source vertex (node) in the graph, the algorithm finds the path with lowest cost (i.e. the shortest path) between that vertex and every other vertex.In this the data transmission time is increased with the protocol standard. One of the section runs with driver unit and LPC2148 with display unit and another PC as server section runs on a Matlab platform. Communications between two nodes (hardware and application) are accomplished through IEEE 802.15.4. The user can give the source and destination node address to the server section. Using IEEE standard communication protocol the shortest path will be feeded into the robotic module. Using the path as a reference, the robot moves in the ordered direction. After reaching the destination node, the display unit displays the name of the particular node.

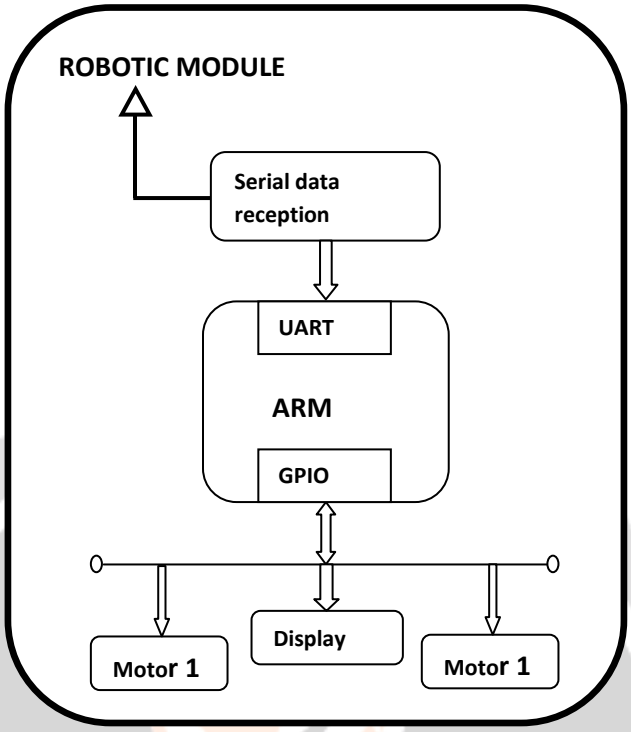
Keywords: *Arm7 lpc2148, matlab, dijkstra's algorithm, robotic module, path planning, robotics*.

1. INTRODUCTION

Dijkstra algorithm is a process of finding the shortest path from one node to all other nodes connected to it in a graph. In this the data transmission time is increased with the protocol standard. One of the section runs with driver unit and LPC2148 with display unit and another PC as server section runs on a Matlab platform. Communications between two nodes (hardware and application) are accomplished through IEEE 802.15.4.



The user can give the source and destination node address to the server section. Using DIJKSTRA'S algorithm the shortest path will be find out and graph plot will be displayed on the server section. Using IEEE standard communication protocol the shortest path will be feeded into the robotic module. Using the path as a reference, the robot moves in the ordered direction.



2. HARDWARE AND SOFTWARE REQUIRMENTS

For any robot hardware and software requirements are considered as an important factor. The hardware and software requirements are explained in details as below.

HARDWARE REQUIREMENTS :

- Amr 7 processor
- Robotic module
- Pc
- Zigbee
- Driver unit

SOFTWARE REQUIREMENTS :

- Keil
- Matlab
- Orcad
- Flash magic
- Proteus

ARM 7 PROCESSOR : Even though there are many types of microcontrollerslike 8051, pic, Arduino, raspherry-pi, etc, ARM7 LPC 2148 has be used because of it advantages of over other microcontrollers

- low power
- less area
- high speed
- better accuracy

LPC 2148 MMICROCONTROLLER : LPC2148 microcontroller board based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit

Thumb mode reduces code by more than 30% with minimal performance penalty.

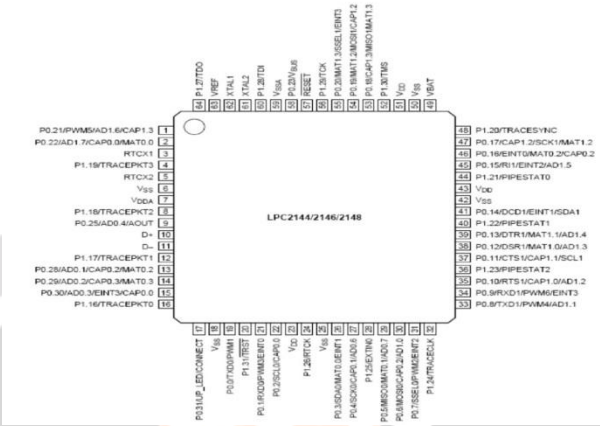


Fig3. LPC 2148 Microcontroller

Due to their tiny size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

ROBOTIC MODULE : Robot model is considered as the hard part of the kit. It mainly consist of three sections in it they are

- power supply section
- uart communication section
- processor and controller section

POWER SUPPLY SECTION : In power supply section mainly it consist of a power guard, on/off switch, led, capacitors (here cylindrical capacitors are used).

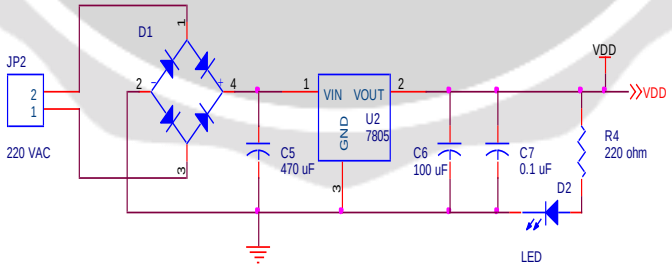


Fig 4 power supply circuit diagram

UART communication section : UART section consists of 2 uart ports U0 and U1 with 9 pins each but only 3 pins are used (2,3,5). 2nd pin is for transmitting the data, 3rd pin is for receiving the data and 5th is connected to ground. This section also consist of a switch to dump the program, reset button, and a LCD interfacing port .

PROCESSOR AND CONTROLLER : Arm controller has 64 pins, out of which 48 pins are i/o pins, 6 PWM pins, 2 analog to digital pins, 2 UART which are capable of transmitting 8 bits, 1 serial pheripal communication, 1 ITOC

these are used to program the robot. Along with this it consist of crystal oscillator in order to transfer the data even without input .

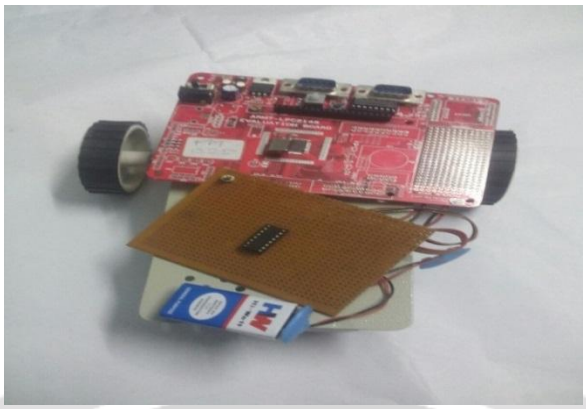


Fig 5 Robotic Module

ZIGBEE : It is a wireless communication which is used to transfer the data from PC to the Robotic Module.

Fig 6 Zigbee module

OrCAD-Circuit Design:

- This tool is used to design the schematic of the hardware.
- Using Orcad the PCB layout is designed

Keilc : This tool is used to develop the source code needed for the design.

- The tool helps us not only to develop but also compile the code and simulate the code.
- The keil tool is also used to convert the compiled Embedded C code to its equivalent hex code.

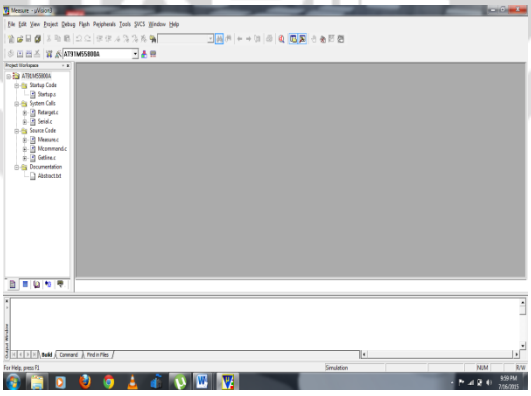


Fig 7Programming And Debugging In Keil

3. RESULTS

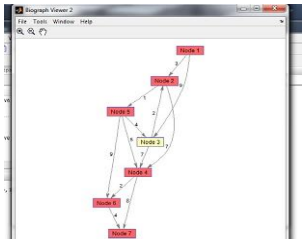


Image (1)

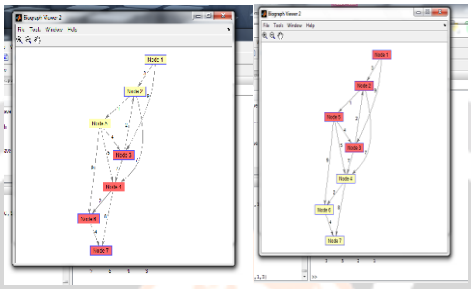


image (2) image (3)

Fig 8 Results of various shortest paths for a robot

4. CONCLUSION

CONCLUSION: Here the user can give source and destination node address to the server section. Using DIJKSTRA'S algorithm the shortest path will be found out and graph plot will be displayed on the server section. Using IEEE standard communication protocol the shortest path will be feeded into the robotic module. Using the path as a reference, the robot moves in the ordered direction. After reaching the destination node, the display unit displays the name (particular place) of the particular node.

REFERENCE

[1] Shivanisanan, Leena jain, Bharti kappor : Shortest Path Algorithm, International Journal of Application or Innovation in Engineering &
Management (IJAIEM) ,vol 2 , issue 7, July 2013, page 316-320.
[2] "Google Cars drive themselves in Traffic", J. Markoff - The New York Times, 2010 - bngumassd.org
[3] Zhanyingzhang and zipingzhao**:**A Multiple Mobile Robots Path Planning Algorithm Based On A-star And Dijkstra Algorithm, International
Journal Of Smart Home, Vol.8 ,2014, page 75-86.
[4] "A Method for Shortest Path Search using Extended Dijkstra's Algorithm", IEEE International Conference on System, Man and
Cybernetics, 2000
[5] Yuan Yuan, DingweiWang : path selection model algorithm for emergency logistics management, computer & Industrial Engineering 56,2009 ,
page 1081-1094.
[6] National Highway Traffic Safety Administration," Automotive Collision Avoidance Systems (ACAS) Final Report". August 2000.
[7] "Proof of a modified Dijkstra's algorithm for computing shortest bundle delay in networks with deterministically time-varying links", Lee,
Fraser.S, IEEE Xplore 2011

[8] A.R. Soltani, H.Tawfik, J.Y. Goulermas, T. Fernando **:**path planning in construction sites: performance evalution of the Dijkstra, A* and GA
search algorithms, Advanced Engineering Informatics 16(2002), page 291-303.
[9] T.Imielinski and J.C. Navas, "GPS-Based Geographic Addressing, Routing, and Resource Discovery," Commun. ACM, vol. 42, no. 4 Apr. 1999
[10]s.pavani, m.keziaarunajyothi : shortest path finding based architecture for vehicle navigation:
[11]Q.Xu, R.Sengupta and D.Jiang, "Design and Analysis of Highway Safety Communication Protocol in 5.9Ghz DSRC," Proc. IEEE VTC vol.57,
no.4, 2003, pp. 2451-2455
[12]A.R. soltani, H.tawfik, T.fernando path planning in construction sites: performance evaluation of Dijkstra ,A* and GA search algorithm.

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