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WPAN Communication Using RSSI for Locomotives Prediction for Transferable Rostrum

Raji Pandurangan[1], Mritunjay Kumar Sinha,[2] Nitish Kumar[3]

[1]Assistant Professor IEEE Students Chapter Chair, Bharath University

[2, 3] B. Tech, Electronics and Communication Engineering, Bharath University

Abstract: ***By using embedded system we are going to develop a mobility platform. Whenever the train arrives the platform automatically will open by intimating a warning to the passengers those who are using the mobile platform. This is done by wireless communication. Each train is connected with RF transceiver, which will send a data of arrival before it reaches the station platform. If the train leaves the platform, then automatically the mobile platform will be bridged between two platforms to build a path between them. This project is designed with PIC18F45J11 Microcontroller. The PIC18F45J11 Microcontroller does the job of fetching the input from the RSSI and gives command to the motor to run in order to tackle the change in the position of the mobility Rostrum.***

Keywords: PIC18F45J11 Microcontroller, MRF24J40 Mi Wi, RSSI, WPAN

1. Introduction

As we Know Railway Platform is busy with huge peoples and rush during peak hours. Old age peoples and psychically challenge peoples are not comfort due to reach the desired platforms. They need a person to take care and guide with equipment's. This leads to difficulty. To overcome this problem, implement a smart embedded system which is more comfort an automatic area.

The passengers have to climb the steps for crossing the railway track in order to catch the desired train to the corresponding platform. So we are implementing mobility platform in embedded system using two major technique. One of them is Wireless Personal Area Network (LR-WPAN) and second one is Radio Signal Strength Indicator (RSSI).

1.1 Mobility Platform System

In mobility platform system, whenever the train near to arrives the platform, the mobility rostrum automatically will open by intimating a warning like buzzer will be ringing, signal light change into green to red and also display a warning "PLEASE DO NOT USE THE MOBILITY ROSTRUM" to the passengers those who are using the mobility platform. This is done by wireless communication. Each train is connected with RF transceiver, which will send a data of arrival before it reaches the station platform. If the train leaves the platform, then automatically the mobile platform will be bridged between two platforms to build a path between them. It's all over performance of mobility platform done using Radio Signal Strength Indicator (RSSI) under WPAN communication system, where radio frequency transmitted and receiving through transceiver in WPAN communication system. Where signal strength directly proportional to the mobility Rostrum. Shown in fig. (a)&(b).

Block Diagram

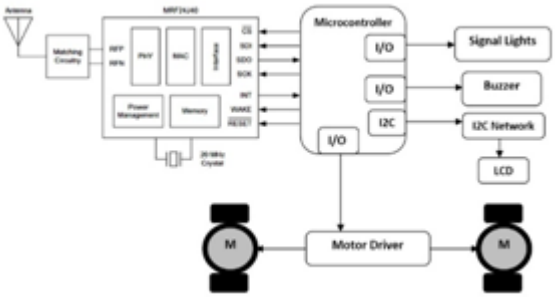

Figure (a): for platform

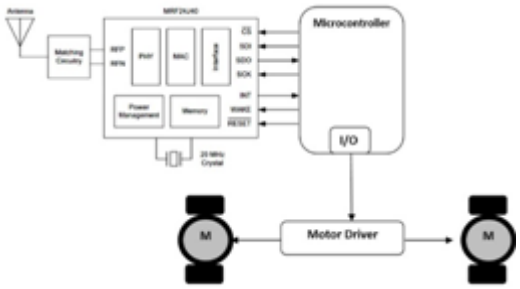

Figure (b): for train

2. PIC18F4XJ11 Microcontroller

A PIC microcontroller is a controller with inbuilt memory and RAM and we can use it to control our projects. So it saves we construct a circuit that has separate external ROM, RAM and peripheral chips. The PIC microcontroller has many built in peripherals and this can make using them quite daunting at first which is why I have made this introductory page with a summary of each major peripheral block. The best way to learn about the main features of a chip and then begin to use each peripheral in a project [1]. shown in fig (c).

PIC microcontroller Feature	PIC microcontroller feature description
Flash Memory	Re-programmable program storage

RAM	Memory storage for variables
EEPROM	Long term stable memory - Electrically ErasableProgrammable Read Only Memory
I/O Ports	High current Input/output ports (with pin direction change)
Timers/ Counters	Typically 3
USART	Built in RS232 protocol (needs only level translator chip)
CCP	Capture/Compare/PWM module
SSP	I2C and SPI Interfaces
Comparator	Internal voltage reference and An analogue comparator
ADC	Analogue to digital converter
PSP	Parallel Slave Port (for 8 bit microprocessor systems)
LCD	LCD interface
Special Features	ICSP, POR, WDT, BOR, PWRT, OST, SLEEP
ICSP	Simple programming using Circuit Serial Programming

2.1 Input/ Output

A PIC Microcontroller can control outputs and react with inputs. With the larger devices it is possible to drive LCDs or seven segment displays with very few control lines as all the work is done inside the PIC Microcontroller. weighing a frequency counter to discrete web designs you'll find two or three chips for the microcontroller design and ten or more for a differ design. So using those saves prototype design effort as you can use built in peripherals to take care of lots of the circuit operation.

2.2 Flash Memory

This is the program storage area and gives you the most important benefit for using a PIC microcontroller. You program the device many times. Devices used in projects on this site can be re-programmed up to 100,000 times (probably more) as they use Flash memory - these have the letter F in the part name. You can get cheaper (OTP) devices but these are One-Time-Programmable; once programmed you can't program it again!

2.3 I/O Ports

Input / Output ports let you communicate with the outside world so you can control LCDs, led or just about anything with the interface. You can also set them as inputs to gather information.

2.4 Pin Direction

The TRIS register controls the I/O direction and setting a bit in this register to zero sets the pin as output while setting it as one sets the pin as input. This allows to use a pin for a lots of task e.g. the Real Time clock project uses RA0, the first pin of PORT A, to O/P data to a seven segment display and at a later point in the program read the analogue value as an input.

2.5 Current

The peripheral interface controller I/O ports are high current ports capable of directly driving LEDs (up to 25ma output current) - the total current allowed usually ~200mA this is often for the whole chip (or specified for several ports combined together).

2.5 Timer/Counter

Each PIC microcontroller has up to three timers that you can either use as a timer or a counter (Timer 1 & 2) or a baud clock (Timer 2).

2.5.1 Timer 0

It is an 8 bit timer with an 8 bit presale that can be driven from an external or internal clock. It generates an interrupt on overflow when the count goes from 255 to 0. Timer 0 always synchronizes the input clock (when using external clock).

2.5.2 Timer 1

This is a 16 bit timer that generates an overflow interrupt when it goes from 65535 to 0. It has an 8 bit programmable presale and you can drive it from the internal clock (Fosc/4) or an external pin. This timer can be used in sleep mode and will generate a wakeup resist on overflow.

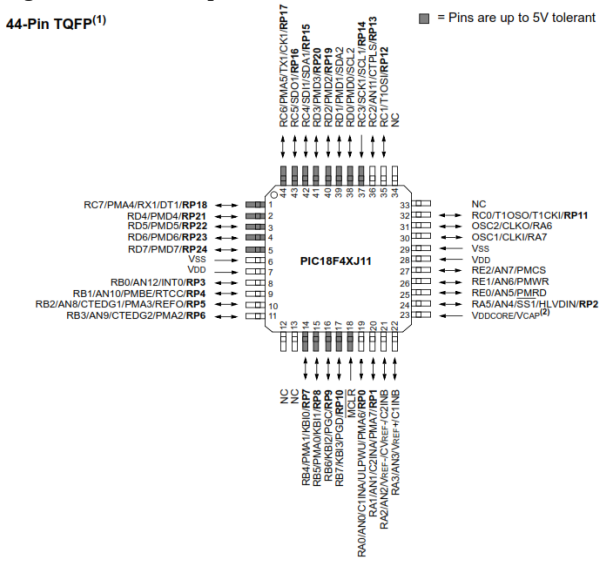

Figure (c): Pin-Diagram: PIC18F4XJ11

3. MRF24J40MICROCHIP

The Microchip MiWi P2P Wireless Protocol is a variant of IEEE 802.15.4, using Microchip's MRF24J40MA 2.4 GHz transceiver and any Microchip 8 bit, 16 bit or 32-bit microcontroller with a Inter Integrated Circuit (I2C). The protocol provides reliable direct wireless communication via an easy-to-use programming interface. MRF24J40 Microchip has a profuse feature set that can be compiled in and out of the stack to meet a wide range of customer needs – while minimizing the stack footprint. MRF24J40 is a integrated IEEE 802.15.4 radio and prevail in the 2.4GHz frequency band. The MRF24J40 handle MiWi and proprietary protocols to provide an ideal solution for WSN, building automation, home automation and consumer applications [2]. shown in fig (d).

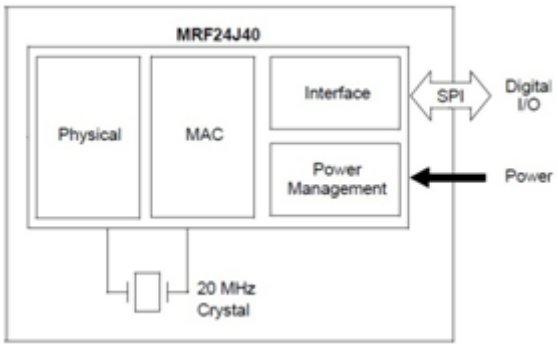

Figure (d): MRF24J40 Microchip

Parameter of MRF24J40 Microchip

Parameter Name	*Value*
Power Output (db m)	0.00
Family	Wireless
Interface	4-wire SPI
Clock	20 MHz
Pin Count	40
Int OSC	20MHz, 32kHz
Max Speed (MHz)	5
IO Pins	2
RF Transceiver	Yes
Max Speed (MHz)1	20
Vdd Min (V)	2.4
Vdd Min (V)1	3.6
Zig-Bee Stack	Yes
MiWi Stack	Yes
Digital Comm. Peripheral	SPI
Rf Data Rate	250
Freq. Range	2.405-2.48
Input Sensitivity (mVpp)	-95.00
RSSI	Yes
Tx Power Consumption (mA)	23.00
f Rx Power Consumption (mA)	19.00
Sleep	Yes
MAC	Yes
MAC Features	CSMA-CA
Encryption	AES128
Encrypt	AES128
Ethernet Type	10Base-T
Comments	IEEE 802.15.4 dutiful, Transceiver

WPAN

Wireless Personal Area Network (LR-WPAN) is used for Irremovable, portable and moving devices within a personal operating space. Wireless networking protocol based on IEEE.802.15.4 (LR-WPAN) running at 2.4 GHz. The major purpose of IEEE 802.15.3 is to provide low cost, low power circulation, low complexity and high data rate connectivity for wireless personal devices. Thus, it is designed for support at least 11 Mbps data rate within at least 10 meters range. The IEEE 802.15.3 standard is operated in 2.4GHz ISM (Industrial, Scientific and Medical) frequency band [3].

RSSI

RSSI is a generic radio receiver technology, which is usually invisible to the user of the device containing the receiver, but RSSI is known to users of wireless networking of IEEE 802.11 protocol family which is basically used for measurement of the received RF power [4 & 5]. Currently, there are three types of RSSI signal propagation model for wireless sensor network (WSN), free space model , 2-ray ground model and log-normal shadowing model (LNSM). The first two models have special requirements for the application environment, while the third model is a more general signal propagation model [6].

MiWi

MiWi is wireless protocols designed by Microchip Technology that is for use short range, low-power digital radios based on the *IEEE 802.15.4* standard for WPAN. It is designed for low data transmission rates and short distance, low cost networks, such as industrial monitoring and control, lighting of home and building automation, automated meter reading and remote control low-power wireless sensors [7]. In this project, MiWi is used to established connections between MRF24J40 Microchip transceiver and PIC Microcontroller. The MiWi Peer to Peer protocol modifies the IEEE 802.15.4 specification's MAC (Media Access Control) layer by adding commands that simplify the hand shaking process. It simplifies link detachment and channel hopping by providing supplementary MAC commands. However, application distinct decisions, such as when to perform energy detect scan, are not defined in the protocol [8]. Show in figure (e)

Figure (e) MiWi

4. Conclusion

In this paper, we are going to developed a mobility platform using embedded system. Where each train is connected with RF transceiver, which will send a data of arrival before it reaches the platform. Where data received by Transceiver and signal goes through matching circuit in which frequency matches, if frequency matches then it pass through physical layer and MAC protocol which is interface with micro-controller. Microcontroller set command to dc motor where dc motor control the movable rostrum. This project help old age peoples and psychically challenge peoples to reach the desired platforms.

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Author Profile

Raji Pandurangan received B.Tech Degree in year 2000 at Bapatla Engineering College, Andhra Pradesh and M.E Applied Electronics from Sathyabama University, Chennai in the year 2011, and pursuing Ph.D. degree in Digital image processing at Bharath University, Chennai. Current working as Assistant Professor and IEEE STUDENTS CHAPTER chair at Bharath University. Her area of interests include Digital watermarking and Cryptographic techniques, Microprocessors and microcontrollers, VLSI Design.

Mritunjay Kumar Sinha done his B.Tech degree in Electronics and Communication engineering at Bharath University.

Nitesh Kumar Singh done his B.Tech degree in Electronics and Communication engineering at Bharath University.