Action Repeating Robot

Advance Microcontroller Project

Under the guidance of –

Prof Venkatarangan M.J

Credits

Team Member	Work Carried Out	Contribution
Rushabh K Patel	- GPIO coding - L298 interface - Algorithm and code for Repeating	High
Sanjay K M	- GPIO coding - L298 interface - RF Interface	High
Shishir Shastri	- RF interface - L298 code & Repeater code.	Medium - High
Suraj Ghale	- RF interface - L298 code - GPIO coding	Medium - High

Introduction

Robotics is one of the main advances in today's modern technology. Due to this and rapid growth it has gained wide popularity and also many of the people have dedicated their life and their career in this domain.

MOTIVATION :

- This project was done to learn and get a hands - on experience with various embedded systems and interfacing protocols.
- This project was a great opportunity to showcase what we had learned on the particular ARM based microcontroller, LPC1768.
- This was purely done with the mindset to achieve the required stages and learn from the various forms of communication and programming the microcontroller.

Ex: RF communication via GPIO and L298-N IC interface.

OBJECTIVE :

The main objective is to run a robot using any one of the wireless methods (in this context RF communication). And store those movements of the robot in the microcontroller and run those movements again and again in a loop.

SCOPE OF WORK :

- The work to be done for this project is to interface L298-N to the microcontroller to control the directions of the motor wheel.
- Interface RF Modules to the GPIO pin of the microcontroller and receive data and save it correspondingly**.**
- Then to make the design an algorithm to make those instructions run again and again in a loop.

Architecture and Design

Components :

- ARM Cortex M3 based LPC1768
- RF receiver and transmitter.
- Encoder IC and Decoder IC.
- Motor and Motor Driver (L298-N)
- Voltage regulators (7805 and 7809)

Hardware Architecture :

Transmitter circuit :

Voltage Regulator (7805) circuit rigged up and the output is used to power the Encoder IC (HT12-E) and the Transmitter module. (Shown in the block diagram)

Receiver circuit and the Robot :

Receiver circuit consists of the the RF receiver and the decoder IC (HT12-D). This is powered by the L298-N IC circuit, by stepping down the voltage battery source with 7805 in L298-N IC. Then the output of the L298-N is connected parallel with the motors to control the direction. (Shown in the block diagram)

Software Architecture :

L298 Software Implementations :

We have configured the 'Enable(EN)', 'Input 1(I/P1)','Input 2(I/P2)' of Motor 'A', Motor 'B' to the GPIO ports of micro-controller and coded and separate function for forward, backward, left, right have been initialized and based on the values of I/P2,I/P1, those separate function is called upon and executed.

RF/GPIO coding:

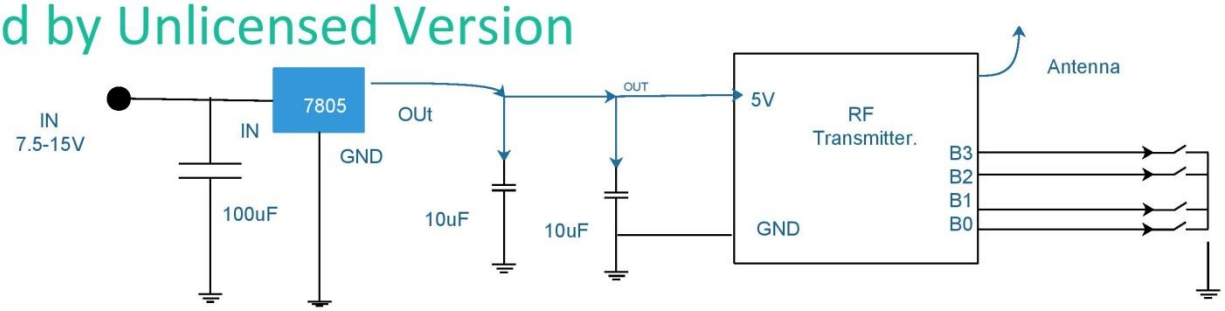
We have configured the GPIO as inputs, and the status of the switches that we enter are transmitted wirelessly are given as inputs to the GPIO pin as mentioned in Block diagram. We are using polling to access the function of the L298 mentioned above.

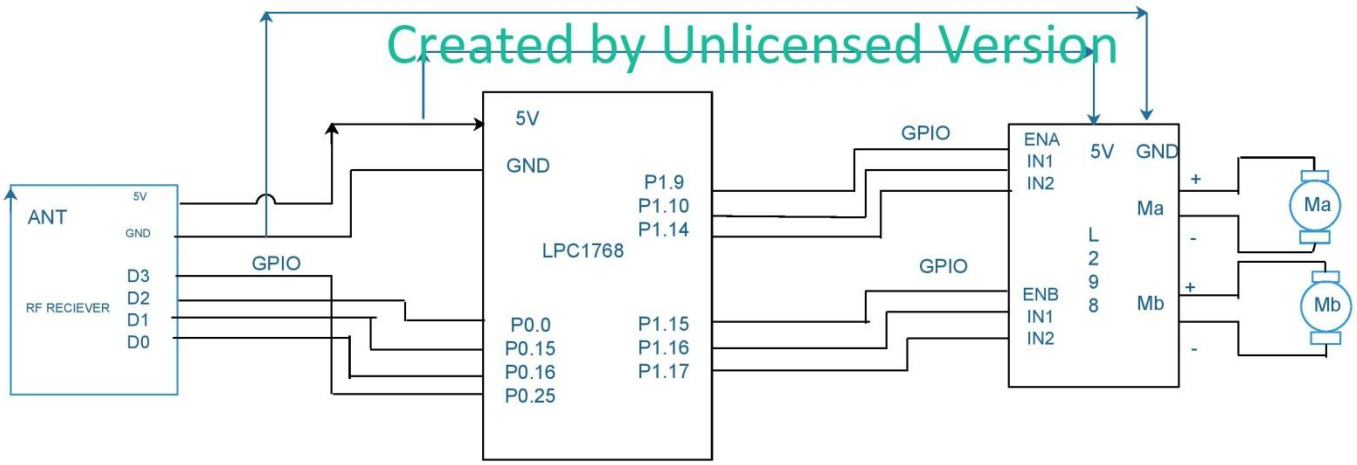
To access the function we assign different switch cases to them. Then we read FIOPIN and save it into a variable and compared to 'low'(0) and based on the values, corresponding cases in checked via polling. The satisfied case is executed. Thus, we can control the Robot movements via RF transmission.

Repeater code:

We assign a integer variable for various movements of the robot. This variable is stored in an array in the order in which the movement occurs. To make the robot repeat the movement, a case statement inside a looping statement is used. The integer variable, helps to decide on what the movement is. (Ex : 1 represents forward, 2 represents backward).

Block Diagram





Outcomes

Stage	Result
L298-N INTERFACE WITH CODE	ACHIEVED
RF INTERFACE WITH CODE	ACHIEVED
REPEATER CODE	SIMULATION WORKING Not able to implement on hardware

Conclusions

Achievements :

- Thus, with this project we gain good knowledge on the give Micro-controller LPC1768.
- We gain the Knowledge of how to read a given datasheet of a particular component and that of the Micro-controller.
- We get an idea of how to tackle a given bug in the system. (Debugging).
- An, in - depth Knowledge on the RF Communication protocol, GPIO configuration and L298-N dual h-bridge.
- We were able to get an idea on machine learning, and what all concepts are involved.

What more can be done to improve on the project?

- We can use Bluetooth save the data and implement the same process which is a lot faster and also gives us an idea about the Bluetooth interface to the Micro-controller.
- This project can be used as a maze solver, by adding more features (Ex :using DSP processor) which involves further complex mathematical computations.

- We can use timer interrupt and make use of buffer so that if the inputs are given instantaneously then it can store it temporarily and execute. This improves latency significantly.
- We can use the concept and modify it and apply it to some household appliances, so that the machines can store the frequent used settings and execute them next time at a faster rate.