CmpE 443 Final Project Design Document
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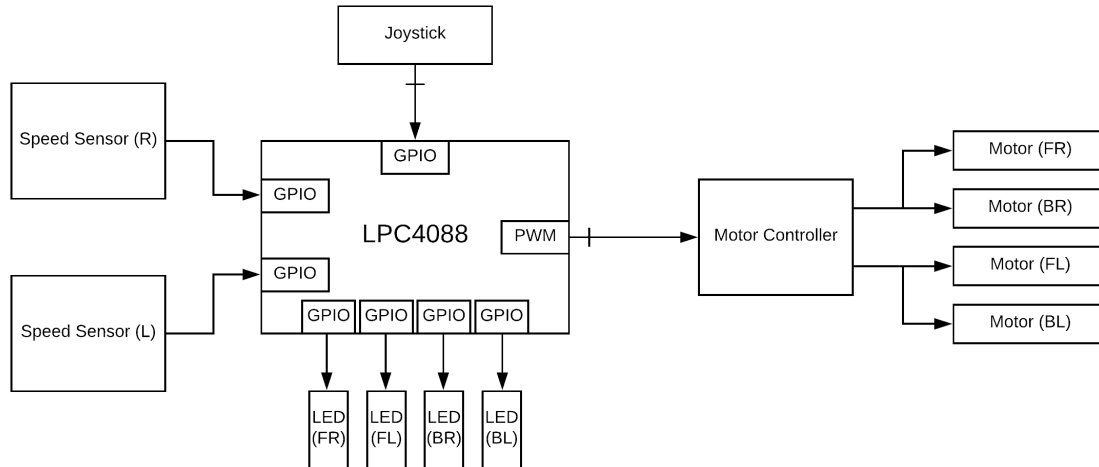# 1   System Level Structural Diagram (Block Diagram)

Figure 1: Block Diagram of car.

LPC4088 Microcontroller: Main part of the car. Runs software and controls peripherals.

Motor Speed Sensor: Used to measure motor speed by counting holes. It's used to first, to detect speed and the second, getting feedback on turn angle of the car.

Motor controller: By getting inputs from the main board, controls motors by means of controlling speed, directions, soft and hard brakes.

Motor: Gives tork to the car, and thus moves.

LEDs: Emits light, controlled by the main board. Used for car signals.

Joystick: Takes input from the player/user and informs the main board, so it can take appropriate action.
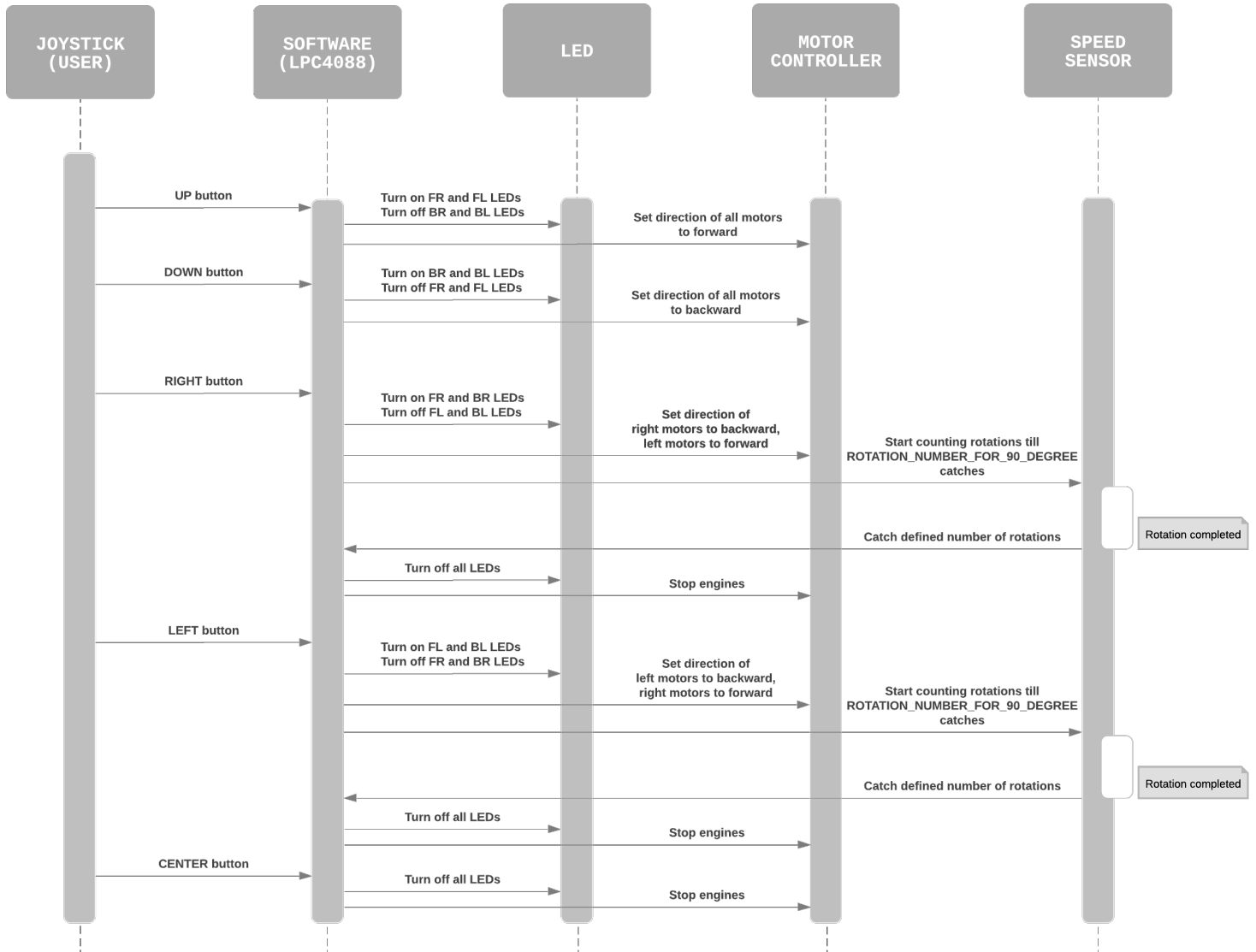
2 Sequence Diagram

Figure 2: Sequence Diagram.

3 LED Connections

All the components which are controlled via LPC4088 should be connected to the board. Therefore, you should determine the pins and their functionalities. Draw the described table in the term project interim report description document. After you determine the all the pins, draw the circuit schematic for the LED circuits.

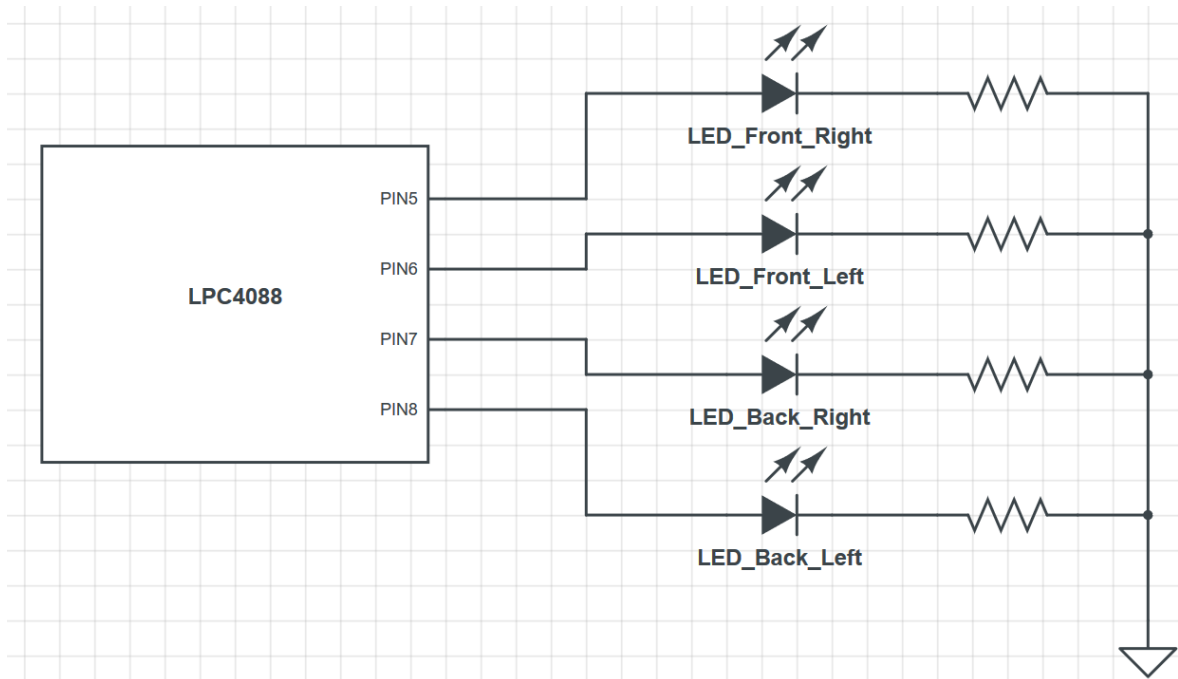| The LED name	LPC4088 PIN	Port	Pin Functionality	Reason
Front Right LED	PIN5	P1.24	GPIO	Supports digital I/O
Front Left LED	PIN6	P1.23	GPIO	Supports digital I/O
Back Right LED	PIN7	P1.20	GPIO	Supports digital I/O
Back Left LED	PIN8	P0.21	GPIO	Supports digital I/O

Table 1: LED Pins and their functionalities

Figure 3: LED Circuit Diagram.

4 Motor - Speed Sensor Connection

Speed sensor PIN	LPC4088 PIN	Port	Pin Functionality	Reason
Power GND	PIN1	GND	Ground	Ground is needed
VCC	PIN44	VU	Power input	For transferring voltage
Right Speed Sensor OUT	PIN15	P0.23	T3_CAP_0	Supports Timer functionality
Left Speed Sensor OUT	PIN34	P1.4	T2_CAP_0	Supports Timer functionality

Table 2: Motor Driver and board PIN connections with their functionalities.

Even though two different speed sensors said to be used in the project description, our implementation can work with only one speed sensor for this part of the project. So, Left is connected to the board by design, but not needed and thus not used.

5 Motor - Driver Connection

There is only one motor controller to control 4 motors. Output A is used for right motors and Output B is for left motors.

Motor Terminal	Motor Driver Terminal
Motor 1 +	Output A +
Motor 1 -	Output A -
Motor 2 +	Output A +
Motor 2 -	Output A -
Motor 3 +	Output B +
Motor 3 -	Output B -
Motor 4 +	Output B +
Motor 4 -	Output B -

Table 3: Motor Driver and motor connections.

6   Driver - Board Connection

Here is the table depicting relations between the board and motor controller:

Motor driver PIN	LPC4088 PIN	Port	Pin Functionality	Reason
Power GND	PIN1	GND	Ground	Ground is needed
+5V Power	PIN44	Vout	Power input	For transferring voltage
A Enable	PIN29	P1.3	PWM0_1 (ENA)	Supports PWM Output
B Enable	PIN30	P1.2	PWM0_2 (ENB)	Supports PWM Output
Logic Input 1	PIN12	P0.8	GPIO	Supports digital I/O
Logic Input 2	PIN11	P0.9	GPIO	Supports digital I/O
Logic Input 3	PIN16	P0.24	GPIO	Supports digital I/O
Logic Input 4	PIN13	P0.7	GPIO	Supports digital I/O

Table 4: Motor Driver and board PIN connections with their functionalities.