# SPIDER INDUCTIONS ELECTRONICS TASK-2

COMPONENTS:

ADC128S102
4013 Flip-flops
LOGIC GATES (AND, NOT, OR)
L293D MOTOR DRIVE
DC MOTORS x2

SPDT Relay (Bonus)

WORKING OF CIRCUIT:

(i) Two pulses are sent into the the input pins (IN0 & IN1) to show the two IR sensor inputs.
The pulse associated with IN0 corresponds to the left sensor & IN1 corresponds to the right sensor.

(ii) The Chip select pin (CS) should be connected for ground for the ADC to work. Else, there will be high impedance in the DOUT pin. Therefore, the pin is supplied with a falling edge signal that starts at t=0s.

(iii) A 8 MHz clock signal is provided to the SCLK pin.

(iv) In 4 clock pulses, one complete pulse train supplied to the DIN should have gotten completed. Therefore, I have chosen the pulse width of the pulse pattern signal sent to the DIN as 500 nanoseconds.

(v) from the datasheet, since we are using IN0 and IN1, the pulse pattern for IN0 is chosen as 00000000 and for IN1, it is chosen as 00001000. I have taken all the DONTC bits (Don't care) to be zero.

(vi) I have supplied 1.8 V to the VA pin because the threshold voltage is 1.8V and 3.3 V to the VB pin because the reference voltage of the digital signal is 3.3V.

(vii) The DOUT pin supplies a 12-bit serial data with its first six bits all being one or zero if the input from IN0 is digital high or low correspondingly and the last six bits are all one or zero corresponding to the input from IN1.

(viii) I have made a 12-bit SIPO shift register from 12-flip flops connected in series to convert the serial output from the DOUT pin to parallel output.

(ix) Using AND gates, I have got two outputs in such a way that the first output is one or zero depending on the IN0 value and the second output is one or zero depending on the IN1 value

| Left | Right |
|---|---|
| 0 | 0 |
| 0 | 1 |
| 1 | 0 |
| 1 | 1 |

→ 0 → Black
→ 1 → White

| IN1 | IN2 | IN3 | IN4 |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |

→ 0 0 → No motion
→ 0 1 → backward motion
→ 1 0 → forward motion

(x) I have used combinational logic to get the following outputs from inputs.

WORKING OF BONUS CIRCUIT

(i) An additional pulse input is given to IN3 pin. The IN0 corresponds to left sensor, IN1 corresponds to centre sensor and IN2 corresponds to right sensor.

(ii) The pulse pattern [redacted] supplied to DIN is changed to accomodate the IN3 pin too. At the end, the signal 00010000 is supplied to accomodate IN3 pin.

(iii) The first 4 bits of DOUT pin corresponds to IN0, next 4 bits corresponds to IN1 and last 4 bits corresponds to IN2.

(iv) Using combinational logic from the 12-outputs of the SIPO register, 3-outputs are derived

each corresponding to the three input ~~pins~~ pin signals.

| Left | Centre | Right |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |
| 1 | 1 | 1 |

| IN1 | IN2 | IN3 | IN4 |
|---|---|---|---|
| 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 1 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

IN3 = Right & IN4 = NOT(Right)
Except the first case where Left, Centre & Right are all zeroes, IN1 = Left & IN2 = NOT(Left).

∴ I am using a combination and AND gates and NOT gates to determine when all the three inputs will be zero. Using a SPDT relay, I am controlling the input to the IN1 & IN2 pins for this case.