الجامعة الألمانية بالقاهرة

(Elct501) Final project

(Elevator)

Team 17.

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Description: -

The aim of the project is to design an elevator system that has ground, 1st, and 2nd, (3 floors). It is controlled by the BASYS3 board. VHDL code is used to model the control of the system. This system was built to carry at least 1 kg of weight and operate in a similar way to a realistic elevator.

Parts: -

FBGA: BASYS3.

6v 133 rpm 8.8 kg.cm DC motor.

H bridge.

6 buttons.

4 IR sensors.

12v Adapter.

wooden body 20cm height per floor& wooden box.

Pulley radius 1 cm & wire.

Methodology: -

1-we use 4 IR sensors to detect the elevator position, if the first sensor is ON this mean the elevator in the first floor, if the second and third sensor are ON this the elevator in the in second floor, if the fourth sensor is ON this mean the elevator in the third floor, all sensors are connected to the FBGA to give it the signals.

2- we use H bridge to control the flow of current to the motor, to make the motor rotate CW & CCW.

3-we use 12v Adapter to deliver the suitable voltage to the motor to work the correct way because the H bridge causes voltage drop.

4- we use 6 buttons. 3 buttons on the FBGA these correspond to control panel. 3 buttons on the body itself these buttons to order the elevator to come to the desired position from outside.

5- we use (6v 133 rpm 8.8 kg.cm DC motor) to carry 1 kg of weight, however it can carry up to 8kg but we controlled the speed from the FSM code to carry 1 kg.

IN, OUT, SIGNALS, STATES: -

IN: Each of one bit   (10 bits)

1. Btn1
2. Btn2
3. Btn3
4. Btn_1
5. Btn_2

6. Btn_3
7. Sensor1
8. Sensor2
9. Sensor_2
10. Sensor3

OUT: Each of one bit

1. Motor Enable
2. CW
3. CCW

Signals: Each of one bit

1. F1
2. F2
3. F3

States:

S1: Indicating that the elevator is in the 1st floor.

S2: Indicating that the elevator is in the 2nd floor.

S3: Indicating that the elevator is in the 3rd floor.

S12: Indicating that the elevator is moving from the 1st floor to the 2nd floor.

S13: Indicating that the elevator is moving from the 1st floor to the 3rd floor.

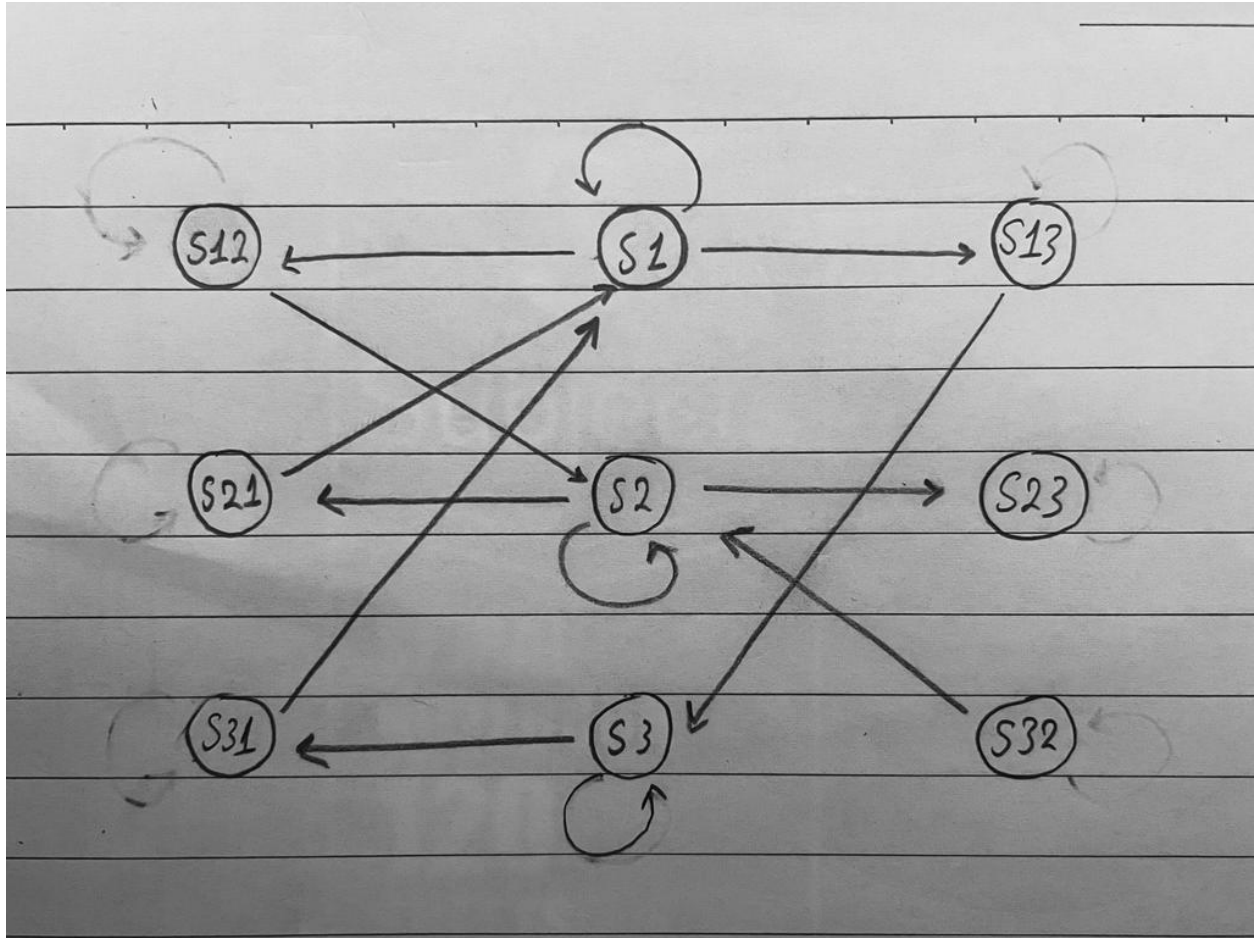S21: Indicating that the elevator is moving from the 2nd floor to the 1st floor.

S23: Indicating that the elevator is moving from the 2nd floor to the 3rd floor.

S31: Indicating that the elevator is moving from the 3rd floor to the 1st floor.

S32: Indicating that the elevator is moving from the 3rd floor to the 2nd floor.

RESULTS' CHARTS AND TABLES: -

	Motor Enable	CW	CCW
S1	0	0	0
S2	0	0	0
S3	0	0	0
S12		1	0
S13		1	0
S21	1	0	1
S23		1	0
S31		0	1
S32		0	1

	Btn1	Btn2	Btn3	Btn_1	Btn_2	Btn_3	Sensor1	Sensor2	Sensor_2	Sensor3	F1	F2	F3	Next State
S1 0000	X	0	0	X	0	0	X	X	X	X	X	0	1	0100
	X	0	0	X	0	0	X	X	X	X	X	1	0	0011
	X	0	0	X	0	1	X	X	X	X	X	0	0	0100
	X	0	0	X	1	0	X	X	X	X	X	0	0	0011
	X	0	1	X	0	0	X	X	X	X	X	0	0	0100
	X	1	0	X	0	0	X	X	X	X	X	0	0	0011
ELSE														0000
S2 0001	0	X	0	0	X	0	X	X	X	X	0	X	1	0110
	0	X	0	0	X	0	X	X	X	X	1	X	0	0101
	0	X	0	0	X	1	X	X	X	X	0	X	0	0110
	0	X	0	1	X	0	X	X	X	X	0	X	0	0101
	0	X	1	0	X	0	X	X	X	X	0	X	0	0110
	1	X	0	0	X	0	X	X	X	X	0	X	0	0101
ELSE														0001
S3 0010	0	0	X	0	0	X	X	X	X	X	0	1	X	1000
	0	0	X	0	0	X	X	X	X	X	1	0	X	0111
	0	0	X	0	1	X	X	X	X	X	0	0	X	1000
	0	0	X	1	0	X	X	X	X	X	0	0	X	0111
	0	1	X	0	0	X	X	X	X	X	0	0	X	1000
	1	0	X	0	0	X	X	X	X	X	0	0	X	0111
ELSE														0010
S12 0011	X	X	X	X	X	X	X	0	0	X	X	X	X	0001
ELSE														Nothing
S13 0100	X	X	X	X	X	X	X	X	X	0	X	X	X	0010
ELSE														Nothing
S21 0101	X	X	X	X	X	X	0	X	X	X	X	X	X	0000
ELSE														Nothing
S23 0110	X	X	X	X	X	X	X	X	X	0	X	X	X	0010
ELSE														Nothing
S31 0111	X	X	X	X	X	X	0	X	X	X	X	X	X	0000
ELSE														Nothing
S32 1000	X	X	X	X	X	X	X	0	0	X	X	X	X	0001
ELSE														Nothing

Circuit used