A Report On
A Microprocessor Based : Fan Speed Sensing and Control
Hardware Design and ALP

Done In Partial Fulfilment Of the Course

Microprocessor Programming and Interfacing

CS- F241

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Problem statement:

System to be designed- Fan Speed Sensing and Control

Description: This system senses the speed at which the fan is rotating and adjusts the speed, based on the user input. The user can select three different speeds of the fan. The current speed should be sensed and the control mechanism should gradually increase the speed to the desired speed.

User Interface:

1. Fan starts when user presses ‘Start’ button.

2. User can then set the required speed by using a keypad interface. This speed value should be displayed on the display.

3. After setting speed initially, user should be able to change the fan speed setting by an up and down switch. Each press on this arrow button increases/ decreases the speed by 1 unit. Min speed value is 1, whereas maximum speed value is 5 Units. Pressing ‘UP’ button after reaching to value 5, should not change the display value or setting of fan speed. Same is true for lower bound.

4. Fan can be stopped by pressing ‘Stop’ button.

5. User can also set the mode of fan as ‘Auto’ mode besides a ‘Regular mode’ setting.

In Auto mode, user should be able to enter the value of time in terms of hours after which the Fan has to be switched off automatically. (For example, if value entered is 2, then the Fan should switch off after 2 hours from the time this setting is applied.)

LIST OF HARDWARE USED:

COMPONENTS	QUANTITY
8086 MICROPROCESSOR	1
OCTAL LATCH 74LS373	3
OCTAL BUS TRANSCEIVER	2
3:8 LINE DECODER 74LS138	1
ROM 2732	2
RAM 6116	2
74LS04 NOT GATE	2
74LS32 OR GATE	6
8255(PROGRAMABLE PERIPHERAL INTERFACING DEVICE)	1
LED 7 SEGMENT DISPLAY	1
D/A CONVERTER DSE_8	1
PUSH BUTTONS	16
DC FAN	1
SWITCH SINGLE POLE DOUBLE THROW	1
DC VOLTAGE SOURCES(5V)	4

INPUT OUTPUT PORT ADDRESS:

PORTA : 00H
PORTB : 02H
PORTC : 04H
CONTROL REGISTER: 06H

MEMORY MAPS:

ROM-2732(4k)

ROM1(Even) : 01000-01FFFH

Starting Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Ending Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1

ROM2 (Odd) : 02000-02FFFH

Starting Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Ending Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1

RAM-6116(2k)

RAM1(Even) : 00000H-007FFH

Starting Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ending Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1

RAM2(Odd) : 00800H-00FFFH

Starting Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ending Address:

A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1

IMPLEMENTATION PROCEDURE:

1. A hex keypad has been created to control the buttons of the fan speed and the increase and decrease functions of the regulator.

2. All the buttons, the buttons which assign the value of speed, as well as those which control the increment and decrement of speed, are integrated within this hex keypad.

3. The operation can be divided in these parts:

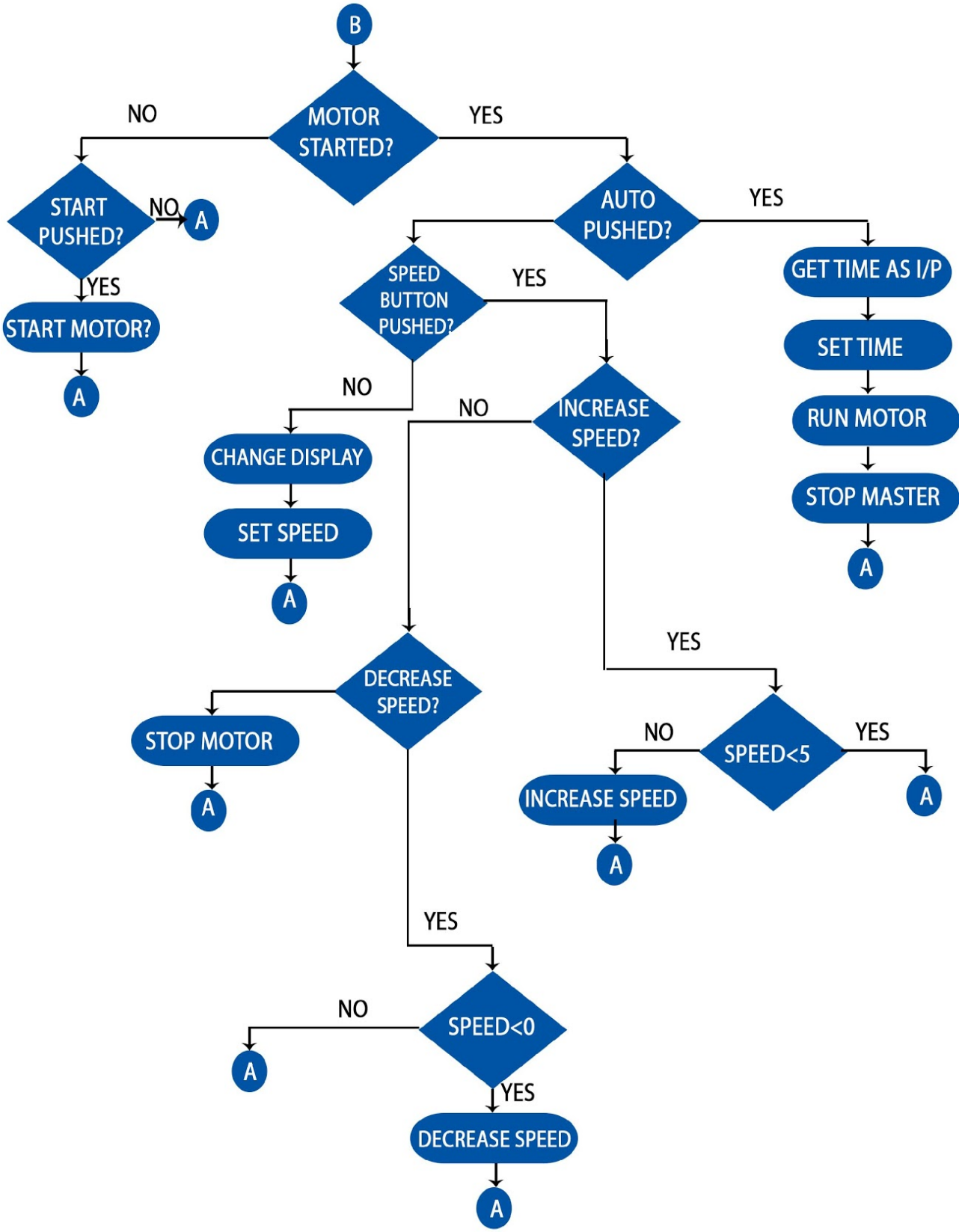
i) By pressing the START and STOP, the user can control the switching ON and OFF the fan.

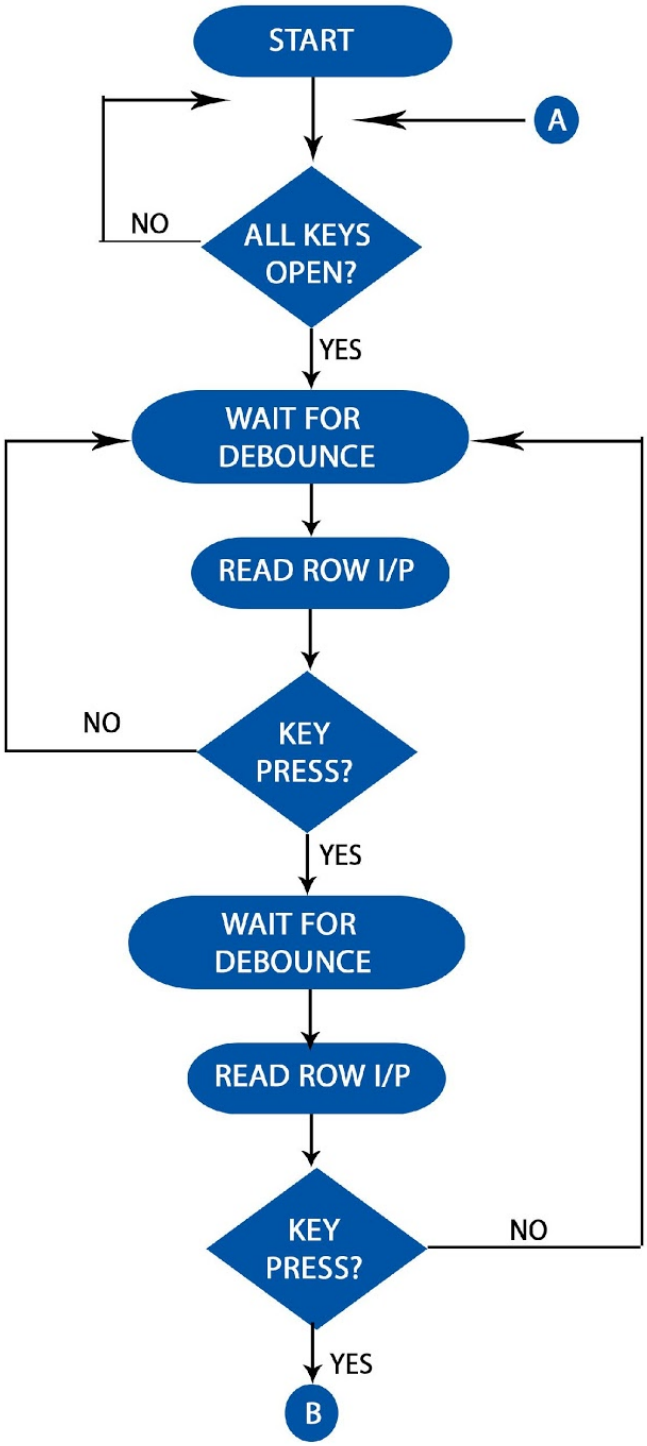
ii) User can directly input the values of the speed which he wants and this speed is displayed onto the 7-segment display.

iii) The user can also control this operation by using the up and down buttons. It can operate in the range of 0-5.

iv) FAN can also be controlled by using the AUTO mode.

FLOWCHART:


B
MOTOR STARTED?
NO
YES
START PUSHED?
NO
A
YES
START MOTOR?
A
AUTO PUSHED?
YES
GET TIME AS I/P
SET TIME
RUN MOTOR
STOP MASTER
A
SPEED BUTTON PUSHED?
YES
NO
CHANGE DISPLAY
SET SPEED
A
NO
INCREASE SPEED?
YES
DECREASE SPEED?
STOP MOTOR
A
NO
SPEED<5
YES
INCREASE SPEED
A
A
YES
NO
SPEED<0
A
YES
DECREASE SPEED
A


START
A
NO
ALL KEYS OPEN?
YES
WAIT FOR DEBOUNCE
READ ROW I/P
NO
KEY PRESS?
YES
WAIT FOR DEBOUNCE
READ ROW I/P
KEY PRESS?
NO
YES
B

ASSUMPTIONS:

1. Auto mode runs at speed 3.
2. Auto mode allows user to enter number between 0 to 10.
3. At a time user presses only one of the given keys.
4. Hours in auto mode is scaled down to seconds.
5. User can start fan only by pressing start button.
6. Fan starts at speed 1 on pressing start button.
7. VCC and MIN/MAX' are connected to +5V.