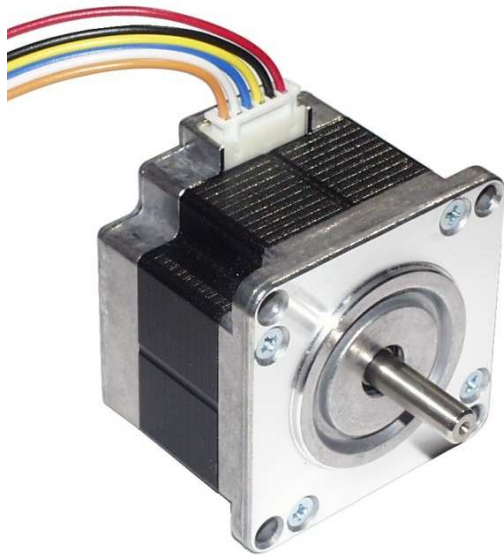


# STEPPER MOTOR SPEED AND POSITION CONTROL



## **Group 8:**

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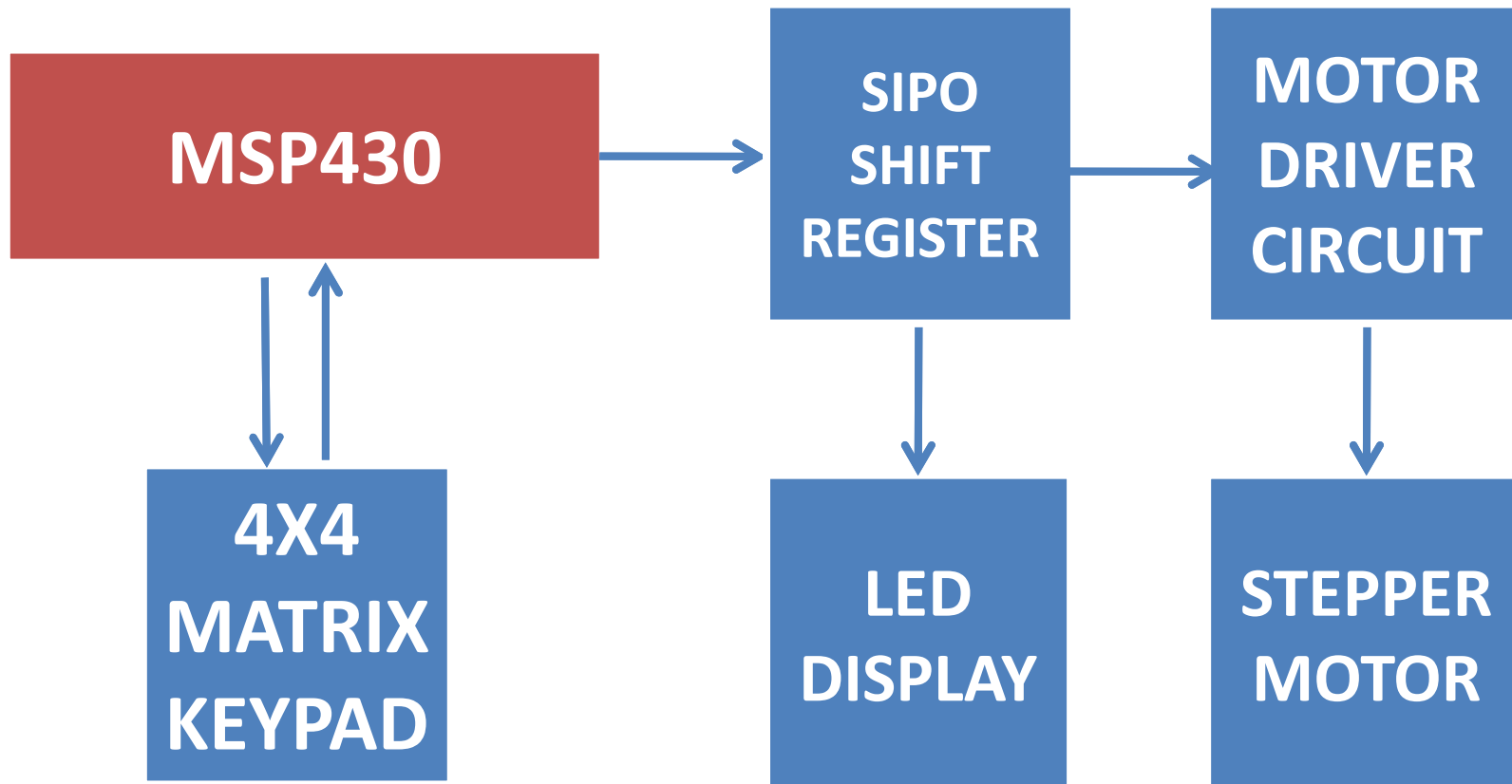
**Bala Subramanyam Yannam**

# APPLICATIONS

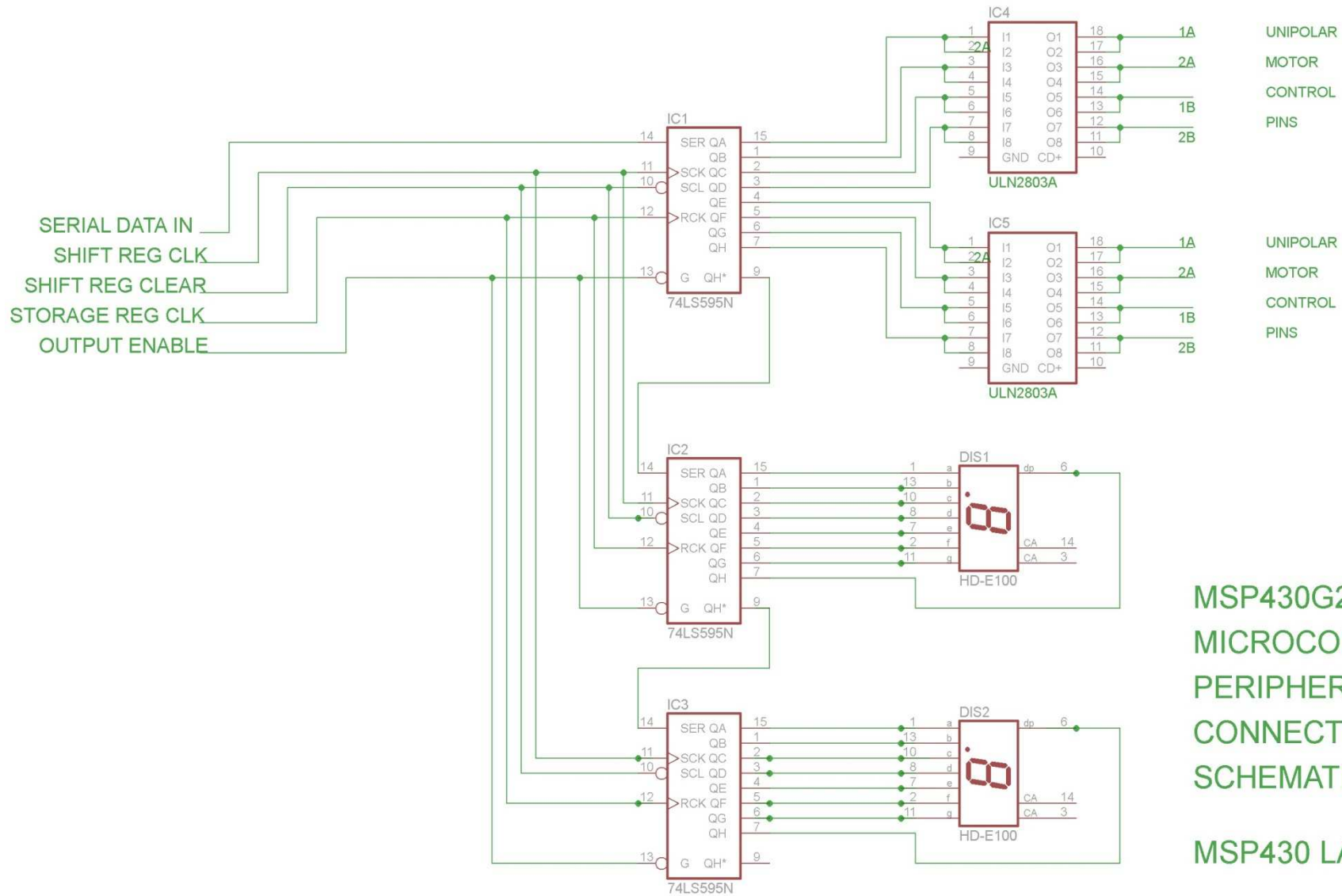
Stepper motors are usually used in digital positioning systems such as -

- pick-and-place systems,
- multi-axis CNC machines and
- other actuators used for positioning of various laboratory and industrial equipment.
- They are also used in multi axis robotic arms.

# BLOCK DIAGRAM



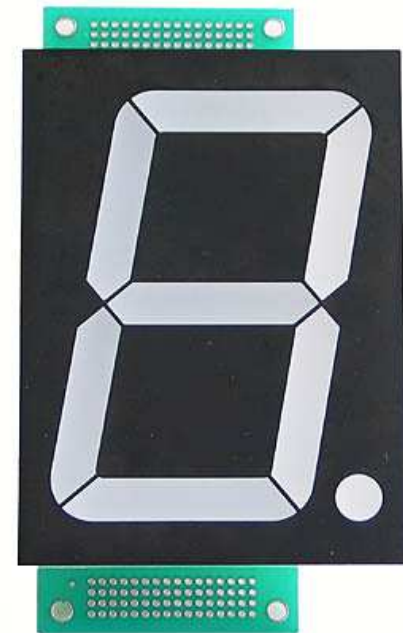
# PERIPHERAL SCHEMATIC



MSP430G2252  
MICROCONTROLLER  
PERIPHERAL  
CONNECTION  
SCHEMATIC  
MSP430 LAUNCHPAD

# DISPLAY

- A Seven segment display is used as an output to display the speed/position depending on user selection.
- Each seven segment display is interfaced with MSP 430 through a shift register.



# KEYPAD

- 4 X 4 Matrix keypad is used as our input device.
- The interfacing is done to the port of MSP 430 in which 4 pins are used as input and 4 pins as output.
- The keypad is used to select the speed/position mode.



# STEPPER MOTOR

Coil Type	- Unipolar
Voltage	- Rated 5VDC
Steps per Revolution	- 48
Step Angle	- 7.5°
Torque- Holding (oz-in /mNm)	- 1.6 / 11.5
Wiring Configuration	- 6 wire interface

As this motor has a 6 wire interface, it can be used as both unipolar and bipolar depending on the wiring.

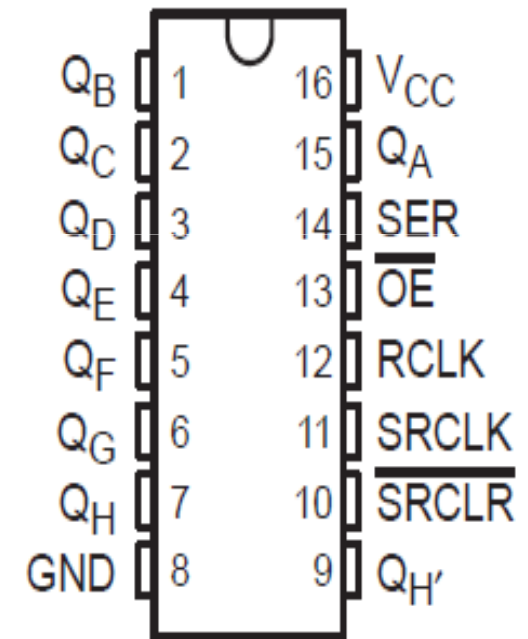


- It is connected to the ULN2803 which supplies the required current to drive the motor.



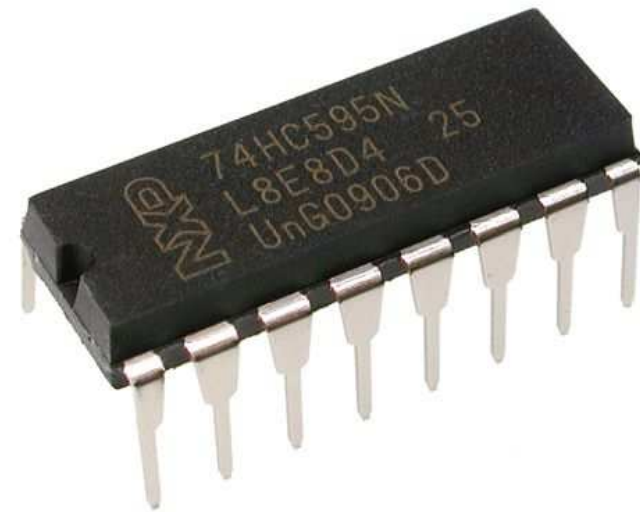
# PORT EXPANSON

- Three cascade serial Shift Register ICs are being used to expand one 8-bit port of the microcontroller to three 8-bit ports.
- Two of the shift registers are used for the seven segment display .
- One shift register is used for the motor.



# 74HC595 SHIFT REGISTER

- The 74HC595 devices contain an 8-bit serial-in, parallel-out shift register that feeds an 8-bit storage register.
- It has tri state outputs.
- It is used for port expansion to connect the seven segment display and the ULN.



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# ULN2803

- The main reason of using the ULN2803 is it acts as an interface between the motor and the shift register.
- Its main requirement is to supply the high current required by motor as MSP cannot not supply that current.



# SOFTWARE INTERFACING

- The software is mainly segregated into three main modules:
- Motor control
- Display
- Reading values from keypad

# SOFTWARE INTERFACING

- The list of functions used in the interfacing
- Serial interface functions  
shiftout(), shiftsend(), pulse clock(), pinwrite().
- Motor control: steppercnt(), wavedrive()
- Display control: sevenseg()
- Keypad: key\_find(), keypad()

# Basic Execution

READ FROM KEYPAD

STORE VALUE ENTERED INTO A VARIABLE

DISPLAY VARIABLE ON THE LED DISPLAY

MODE OF OPERATION FOR MOTOR IS SELECTED

STORED VALUE FROM KEYPAD IS USED TO CALCULATE THE DELAY  
B/W STEPS OR NO: OF STEPS

THE VALUE CALCULATED IS SENT TO THE MOTOR SUB-ROUTINE WHICH  
GENERATES THE REQUIRED STEPPING SEQUENCE TO DRIVE THE MOTOR

## PROBLEMS FACED

- Controlling the motor and LED's independently through serial to parallel interface.
- Memory insufficient in dumping the code onto certain IC's.
- Shift register interfacing

# CONCLUSIONS

- The project was completed successfully to the given specifications.
- The following slide demonstrates the final working.





# STEPPER MOTOR HARDWARE IMPLEMENTATION

The background features a complex, abstract design. It consists of numerous thin, dark blue and black lines that swirl and curve across the frame. Interspersed among these lines are small, solid black dots and some hollow white circles. The overall effect is reminiscent of a network diagram or a microscopic view of fibers. The colors are primarily shades of blue, ranging from light sky blue to deep navy blue, with black accents.

Thank

You