
Microcontroller-Based Vehicle Parking Automation Design AT89S51

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ABSTRACT

The development of the world of transportation, especially land transportation such as cars as well as the development of shopping centers, restaurants, entertainment and recreation facilities that are growing very rapidly make every entrepreneur who manages parakeet lands to think about parking spaces for future visitors. Customers will feel comfortable and calm if they are easy to find a parking space for their vehicle and easy to find their vehicle again. With this condition, it is necessary to have a tool that can tell customers where the empty parking blocks are so that customers no longer need to circle around just looking for empty parking blocks. The more crowded visitors who come to the parking area, the more busy the parking attendants who manage parking are Manually. Therefore, we need a way to solve this problem. Based on these problems, this research designed a vehicle parking automation based on the AT89S51 microcontroller where the microcontroller will check the condition of the parking entrance, if there is a vehicle in front of the door, the microcontroller will check the conditions in each place. If there is an empty place, the LCD will display the place, then the microcontroller will order to open the parking door. The door will close again after the vehicle enters. This process will continue until all parking spaces are filled.

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1. INTRODUCTION

Parking arrangements are usually carried out by a parking attendant, a parking attendant is only able to park 1 vehicle at a time, what if at the same time there are 3 or more vehicles that will park. This will inconvenience the parking attendants and result in other vehicles that will be parked being delayed for a long time waiting for the parking attendants to finish parking other vehicles. This tool functions to automatically direct drivers to look for blocks / parking locations that are still empty, so drivers don't have to bother going around the parking lot to look for empty blocks.

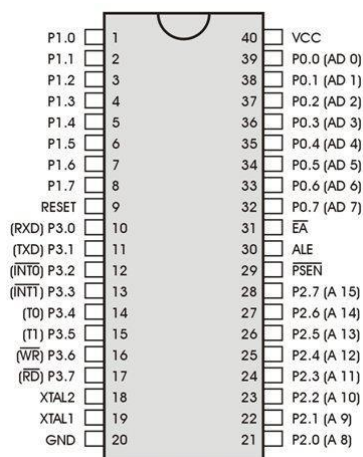
A. Microcontroller AT89S51

Microcontroller AT89S51 is a development from microcontroller MCS-51. Microcontroller this normal called also with microcomputer CMOS 8 bit with 8 Programmable kbytes up to 1000 time programming. Besides that AT89S51 too have capacity RAM as big as 128 bytes, 32 I/O channels, Watchdog timer, two data pointers, three timers/counters 16-bit, Programmable UART (Serial Port).

memory Flash used for store standard commands (instructions) MCS-51, so that allow microcontroller this work alone without additional chips are required (*single chips operations*), mode operation chip single which no need external memory and memory the flash capable programmed until one thousand time. Thing other which profitable is system programming Becomes more simple and no need Suite which complicated.

Microcontroller AT89S51 have feature :

1. A CPU (*Central Processing Unit*) 8 Bits.
2. 128 bytes RAM (*Random Access memory*) internally.
3. Four fruit port I/O, which each consist from 8 bit
4. Oscillator internal and Suite timer.
5. Two fruit *timer/counter* 16 bit
6. Five interrupt lines (2 pieces external interrupts and 3 interrupts internal).
7. A port serial with *full duplex* UART (*Universal Asynchronous Receiver Transmitters*).
8. Capable doing process multiplication, distribution, and Boolean.
9. EPROM which big 8 KBytes for memory program.
10. Maximum speed of execution instructions per cycle is 0.5 s on frequency *clock* 24 MHz. If the *clock* frequency microcontroller which used is 12 MHz, so speed implementation instructions is 1 s.



Picture 1. Configuration PIN Microcontroller AT89S51

The following is an explanation of function of each pins (legs) which there is on microcontroller AT89S51.

- **Port 0**

is *dual-purpose* port (port which has two uses). On design which minimum (simple), port 0 is used as port *Input/Output* (I/O). port 0 found in pin 32-39.

- **Port 1**

Is a port that only works as port I/O (*Input/Output*). Port 1 there is on pin 1-8.

- **Port 2**

is *dual-purpose* ports. In the minimum design it is used as port I/O (*Input/Output*). While on further design is used as *high bytes of address* (address). Port 2 is available on pin 21-28.

- **Port 3**

Port 3 is wrong one *port* which serves as *general purpose* I/O with a width of 8 bits. Port 3 consists of P3.0, P3.1, to P3.7. Apart from being an I/O line, *port 0* also working as track receiving/shipping data on communication serial, *external interrupts*, *timers/counters*, and *external data memory write/read strobe*.

- **PSEN (*Program Store enable*)**

PSEN is signal control which allow for access program (*code*) memory external. Pin this connected to pin OE (*Output Enable*) from EPROM. Signal PSEN will “0” (*LOW*) on Step *fetch* (pick-up) instructions. PSEN will always worth “1” (*HIGH*) on program memory reading internally. PSEN there is on pin 29.

- **ALE (*Address Latch enable*)**

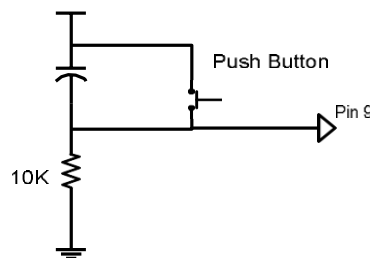
ALE used for men-*demultiplex address* (address) and data bus. when use program memory external, port 0 will working as *address* (address) and data buses. On half beak first memory cycle ALE will be “1” (*HIGH*) so that allow writing *address* (address) on external registers. And at half the next half will be worth “1” (*HIGH*) so port 0 can be used as data buses. ALE found on pin 30.

- **EA (*External Access*)**

If the EA is inputted “1” (*HIGH*), so microcontroller operate program memory internal just. If EA given input “0” (*LOW*), so AT89S52 operate program memory external (PSEN will worth “0”). EA there is on pin 31.

- **RST (*reset*)**

RST is located on pin 9. If on pin this given input “1” (*HIGH*) During minimum 2 *machine cycles* , so system will reset and register internal AT89S51 will contain certain *default values* .Process reset is process for restore the system to its original state. Reset no influence internal program memory. Reset occur if pin RST worth high During minimum two cycle then returns low. Power on reset is process reset which in progress by automatic on moment first system times supplied. Process this influence all register and internal data memory. To get process this, so pin RST must given additional circuit as in the picture following.



Picture 2. Suite Reset AT89S51

- **XTAL1 And XTAL2**

Microcontroller AT89S51 equipped with a clock source / oscillator internal (*on chips oscillator*) which could used as source *clock* for AT89S51. For use oscillator additional internal required crystal or ceramic resonator between XTAL1 pen and XTAL2 and a capacitor to *ground* . For the crystal could used frequency from 3 until 24 MHz. Whereas for the capacitor could is 33 pF \pm 10 pF. When using source *clock* external so XTAL 2 NC (*No Connections*) and source connected with XTAL1.

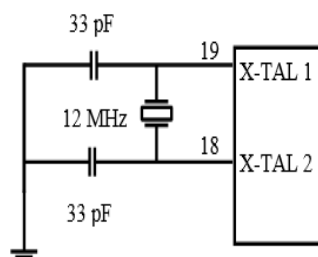


Figure 3. Circuit on chip oscillator AT89S51

- **VCC**

VCC is source input voltage positive for the microcontroller which there is on pin 40.

B. Stepper Motor

Motors convert electrical energy into mechanical energy. A Stepper Motor converts electrical pulses into specific rotational motion. The motion created by each pulse is precise and repeatable, therefore applications that require positioning applications. A stepper motor is an electromechanical device that works by converting electronic pulses into discrete mechanical motion. Why is it called discrete? Because the stepper motor actually rotates gradually, not continuously like the rotation of an AC induction motor. The stepper motor moves according to the sequence of pulses given to the motor. Therefore, to drive a stepper motor, a stepper motor controller is needed which generates periodic pulses. Based on the control circuit design method, stepper motors can be divided into unipolar and bipolar types. The unipolar stepper motor control circuit is easier to make because it only requires one On Off signal by using a switch / transistor on each winding. Look at the picture of the unipolar stepper motor winding below

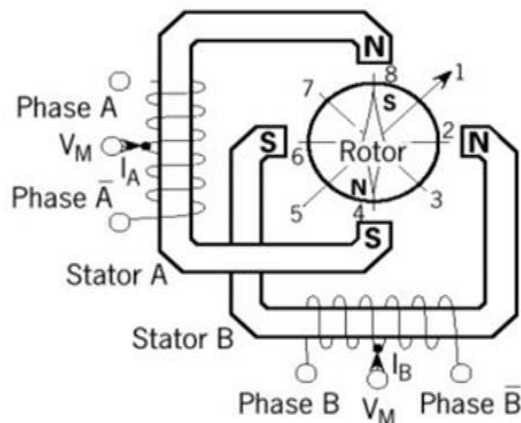


Figure 4. Unipolar stepper motor winding

To start and stop this motor, it is enough to apply a digital pulse consisting of only positive and zero (ground) voltages on one terminal of the motor winding while the other terminal is supplied with a constant positive voltage (V_M) in the center (center tap) of the motor coil.

C. LCD

LCD is an optoelectronic component, namely components that are worked on or influenced by light (*optoelectronic*), light-emitting components (*light-emitting*) and components that affect light change. LCD is made of liquid crystal material which is an organic component that has optical properties like a solid even though the object remains liquid. Examples of such components are cholesteryl *nonanoate* and *pazoxyanisole* crystal cells reflect or transmit light, and not generate light, the electrical power required is very small. The energy used is only to activate the liquid crystal . LCD requires an alternating power source in the form of a sine or a square because when direct current is used, electrolysis will form on the electrodes which can damage these components. AC voltage is required to power the segments, which is used between segments and is the same for all segments. Segments and forms a capacitor that requires a small amperage as long as the AC frequency is kept low and usually no more than 25 Hz, as this will result in a vibrating display.

2. RESEARCH METHOD

Based on on destination which want to achieved method- method which used in the preparation of this research is Literature Study, that is by getting data by reading books and journals related to the problems discussed in study this. The flowchart of this research is as shown in the following figure.

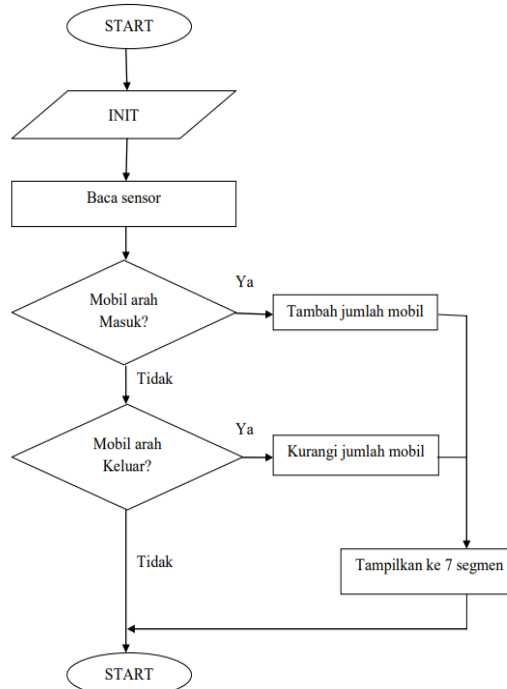


Figure 5. Research flowchart

3. RESULTS AND DISCUSSIONS

Test Suite System Microcontroller AT89S51 This test is carried out using a circuit such as following picture

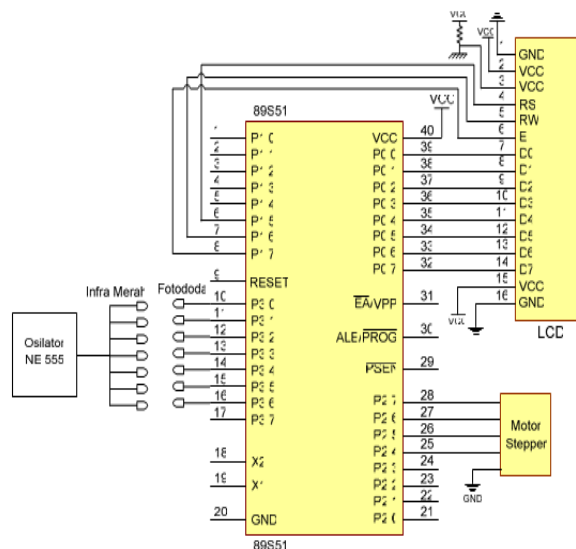


Figure 6. Suite test microcontroller-based vehicle parking automation AT89S51

This research will be used in closed types of parking such as mall basement parking, where there are entry and exit posts for vehicles and slots for parking. The sensor will be read when the car is directly above it, so if there is a vehicle on top of the aluminum foil, the doorstop will automatically open, and vice versa when the car wants to get out of the parking lot. The test results are as shown in the following table.

Table 1. Testing when the car enters

car to-	Sensor	Seven Segments	buzzer
1	On	2	Low
2	On	3	Low
3	On	4	Low
4	On	5	Low
5	On	6	Low
6	On	7	Low
7	On	8	High

Table 2. Testing when the car comes out

car to-	Sensor	Seven Segments	buzzer
1	On	8	High
2	On	7	Low
3	On	6	Low
4	On	5	Low
5	On	4	Low
6	On	3	Low
7	On	2	Low

In the following table is the time of testing the car out Seven segment and buzzer are devices that will indicate if the parking capacity is full.

4. CONCLUSION

This study discusses the automation of vehicle parking based on the AT89S51 microcontroller. The results of this study can be concluded as follows:

1. Device soft from system which made could arrange and determine the steps that the microcontroller must perform on the whole system which made
2. Miniature system which made could work as should be after supported by device hard (*hardware*) and device soft (*software*).

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