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# Computer controlled automated small vehicle

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## Abstract

This paper represents a computer controlled small vehicle. This type of vehicle can move in a predefined path without human operator intervention and can collect data from the surrounding environment. This data has been processed by a well structured hardware and software. After processing the received data is sent to the vehicle to move it in its correct path. This type of vehicle can be used in variety of application such as military spying, fire fighting system etc.

**Keywords :** controlled small vehicle, computer controlled automated small vehicle

## 1 INTRODUCTION

A 6 volt motor operated small vehicle is developed which is fully computer controlled. The developed system has been interfaced with PC through standard parallel printer port of an IBM compatible Pentium I processor. Micro-switch sensors /1/ has been attached with the body of the vehicle at different locations to collect data from the surrounding environment. Five sensors are used for this purpose and they are attached on front, back, lower front and two sides of the vehicle. Data from the vehicle is serially sent towards the PC through a transmission line using serial data transmission standard. A software has been developed using 'TURBO C' language to process this data and suitable command has been sent serially towards the vehicle to move it in its correct path. The complete system is shown in block diagram in figure 1.

## 2 Peripheral hardware design:

Design of peripheral hardware is necessary due to serial transmission of data. From the micro-switches data are directly used to communicate with PC and it is not necessary to convert signal from A/D /2/. It is possible to use serial port for data transmission but it has a serious drawback- the transmission rate is fixed at RS 232 standard /3/ and cannot be modified. Receivers and other timing circuits should be arranged according to this standard. For this reason parallel port is used and parallel to serial conversion is necessary.

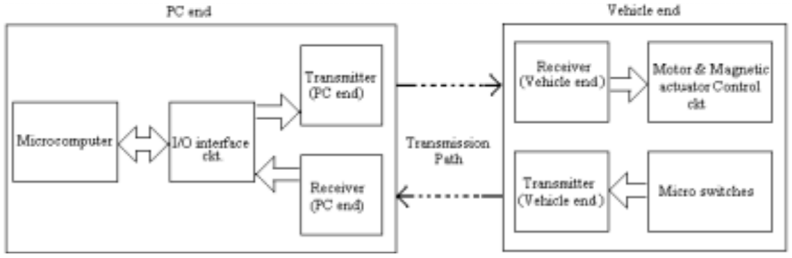


**Figure 1 - simple block diagram of the complete system**

### 2.1 Parallel to serial conversion /4/:

Data handle by the computer is parallel so it should be converted into serial for transmision. For this reason a parallel to serial shift register is used (IC-74LS165). It shifts parallel data with each clock pulse. This conversion is used when data goes from computer to vehicle and when data goes from vehicle to computer.

### 2.3 Serial to parallel conversion /4/:

For this type of conversion a serial to parallel converter (IC-74LS164) is used. After conversion of serial data different bits of parallel data is used to activate motor driving circuit and magnetic actuator. This conversion is used when the data reach at

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the vehicle from computer or data reach at the computer from the vehicle. Processing of data is done in computer with 8 bit in parallel. Among the data bits two bits are used in the motor driving circuit to move the vehicle and two bits used in the magnetic actuator circuit to turn the vehicle left or right. Different movements of the vehicle are given in table-I according to the bit pattern.

Table I - Movement of the vehicle for different data

| Data bit combination | | | | Movement of the vehicle |
|---|---|---|---|---|
| D4 | D3 | D2 | D1 | |
| 0 | 0 | 0 | 1 | Forward |
| 0 | 0 | 1 | 0 | Backward |
| 0 | 1 | 0 | 1 | Forward & Right |
| 1 | 0 | 0 | 1 | Forward & Left |
| 0 | 1 | 1 | 0 | Backward & Right |
| 1 | 0 | 1 | 0 | Backward & Left |

Following table-II shows the location of different micro-switches connected to the different data bits.

Table II - Data bit positions for different sen-sor

| Location of micro-switches | Data Bit used for Signaling |
|---|---|
| Front side of vehicle | D1 |
| Left side of the vehicle | D2 |
| Right Side of Vehicle | D3 |
| Back side of the vehicle | D4 |
| Front Down side of the vehicle | D5 |

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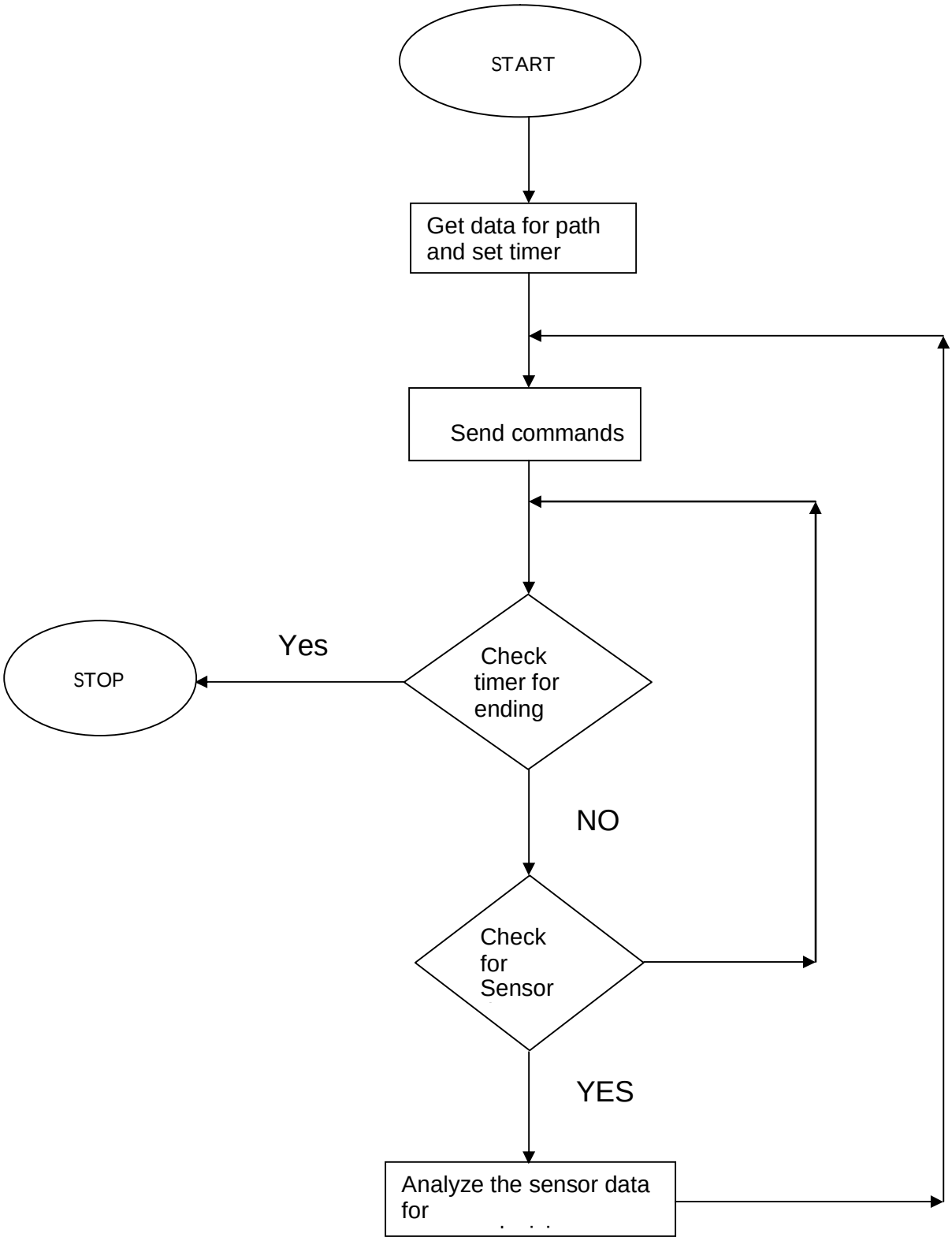


FIG. 2 - Flowchart for the vehicle control

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## 3. Computer Interfacing

The developed system has been interfaced with PC through parallel printer port /5/. This port will allow the input of up to 9 bits and the output of up to 12 bits at one given time. The port is composed of 4 control lines, 5 status line and 8 data lines. It is found commonly on the back of the PC on a D-type 25 pin female connector. The port address for parallel printer port is fixed to 378 hex to 37F hex for LPT1and 278 hex to 27F hex for LPT2. Parallel port LPT1 is used in that case. The base address 378 hex is used for data port or register, address 379 hex is used for status port and 37A hex is used for control port. By changing the value of bit-5 of the control port data can be read back to the PC through data lines. The bit pattern used to control the vehicle is summarized in table-I and table –II.

## 4. Software Develpement

Control software directs the way in which data can be read from the interfaced circuit, analyzed, modified and returned to the outside world. The software has been developed using programming language “Turbo C”. Transmission and reception process is established with the outportb and inportb function respectively. This software can be developed using any other language. Like a road map, flowcharts are used to reveal how to go from a starting point to the final decision. However, the entire receiving, transmitting and process for the vehicle control systems is shown in the flowchart given is the figure-2which shows the flowchart of the developed software.

## 5. Conclusion

The computer receives data from vehicle through interfacing circuit to it and motivating the vehicle control software. In this type of closed loop control systems /6/ receiving and transmitting time may be reduced if the software is developed in assembly language. High precession movement of the vehicle can be achieved if the number of sensors is increased and the IR, ultra sound etc. type of proximity sensors /1/ are used.

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