

AVR-based Embedded System of High-resolution Ultrasonic Radar Distance Measurement

Abstract

With the development of automobile industry, the number of private cars is greatly increasing. Correspondingly, the number of rookie drivers is increasing as well. For the rookie drivers, how to backing is always a troublesome operation. Many of them complained that their valuable cars are easily got damaged by obstacles that are hardly seen through their rearview mirror. So in this project, we present a new type system: AVR-based embedded system of high-resolution ultrasonic radar measurement with different display mode and output data mode:

1. A new mode of TV On-screen character display (OSD) technology: Without interrupting watching normal program on the car TV screen in car, it is designed to avoid potential accidents by telling the driver the minimal distance of obstacles behind the car which may be neglected by drivers.

2. LED and light-emitting bars display modes: Ordinary display modes. 8-segment LED*3 are used to display the distance of obstacles. We use 10 light-emitting bars to show the distance as well. The more bars are lightening, the closer obstacles are.

3. Data output via multifunctional port in different protocols. In fact, we use the protocol RS232 in order to communicate with PC for debugging. In this view, the system can be easily used not only in automobiles, but also in various domains such as automated guided vehicles (AGVs) technology, other logistics carriers and so on.

Another highlight of this system is the high-resolution of ultrasonic radar distance measurement. Since we adequately fulfill the potential of the AVR MCU with optimized software codes, the system has a minimum resolution of 1 cm as well as a maximum range of 1.50m, while the MCU can handled the process of different display mode at the same time.

Now they will be explained at length.

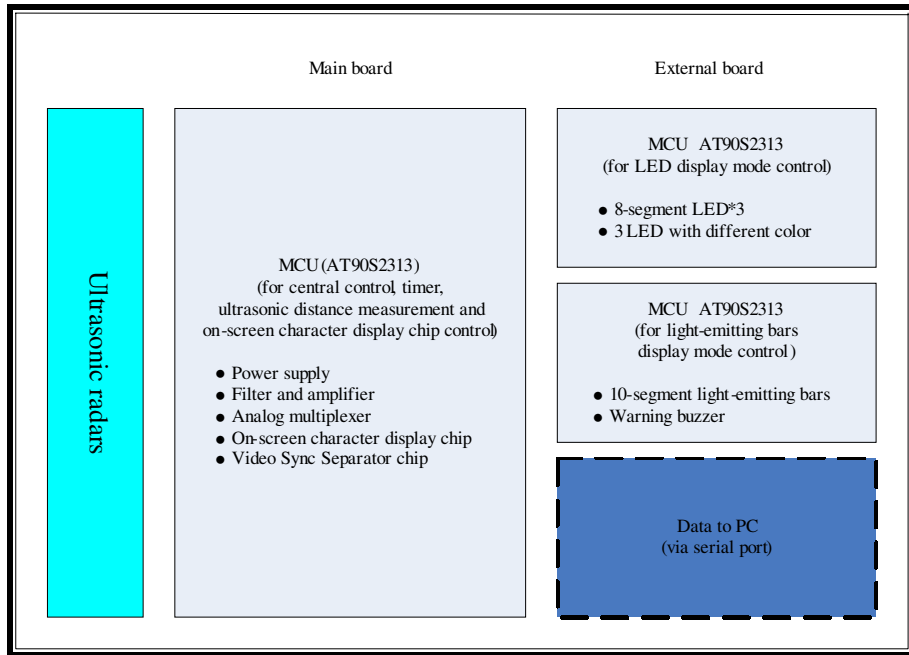


Figure 1 Hardware block diagram

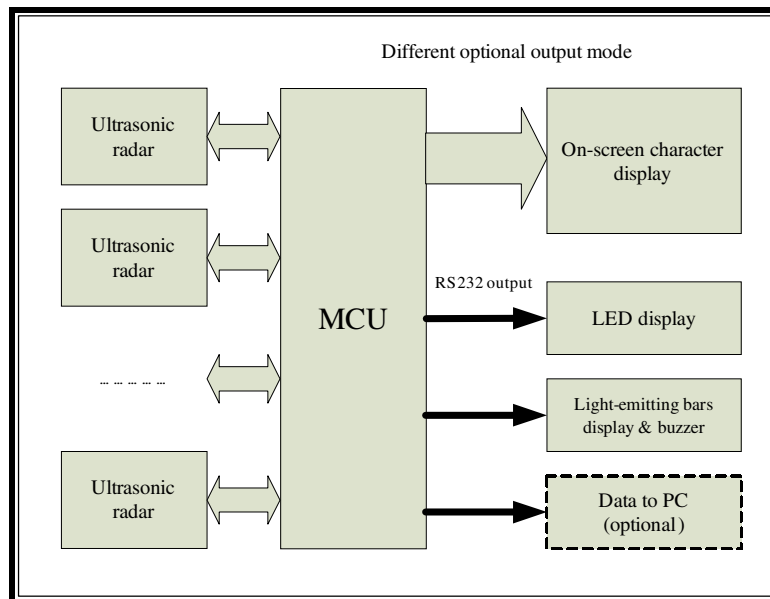


Figure.2 Hardware structure diagram

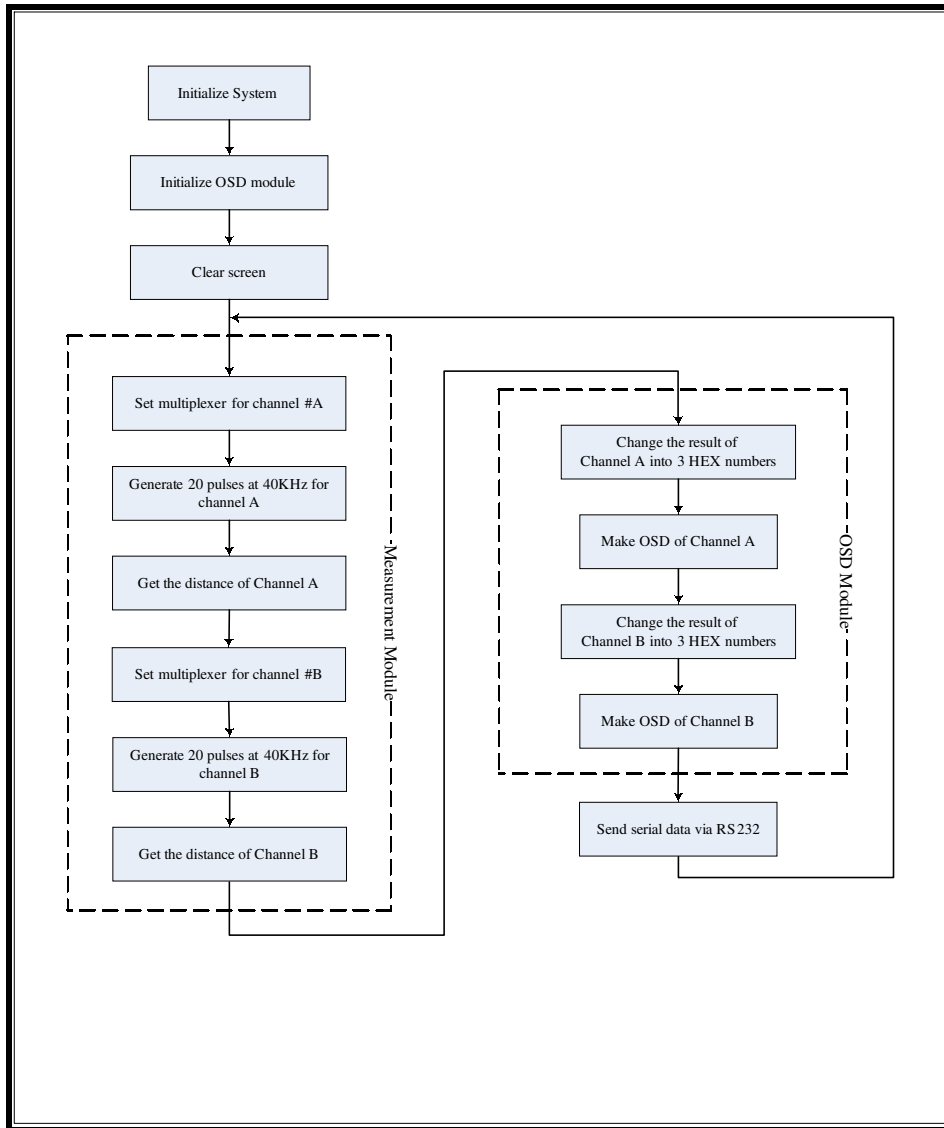


Figure.3 Software structure diagram

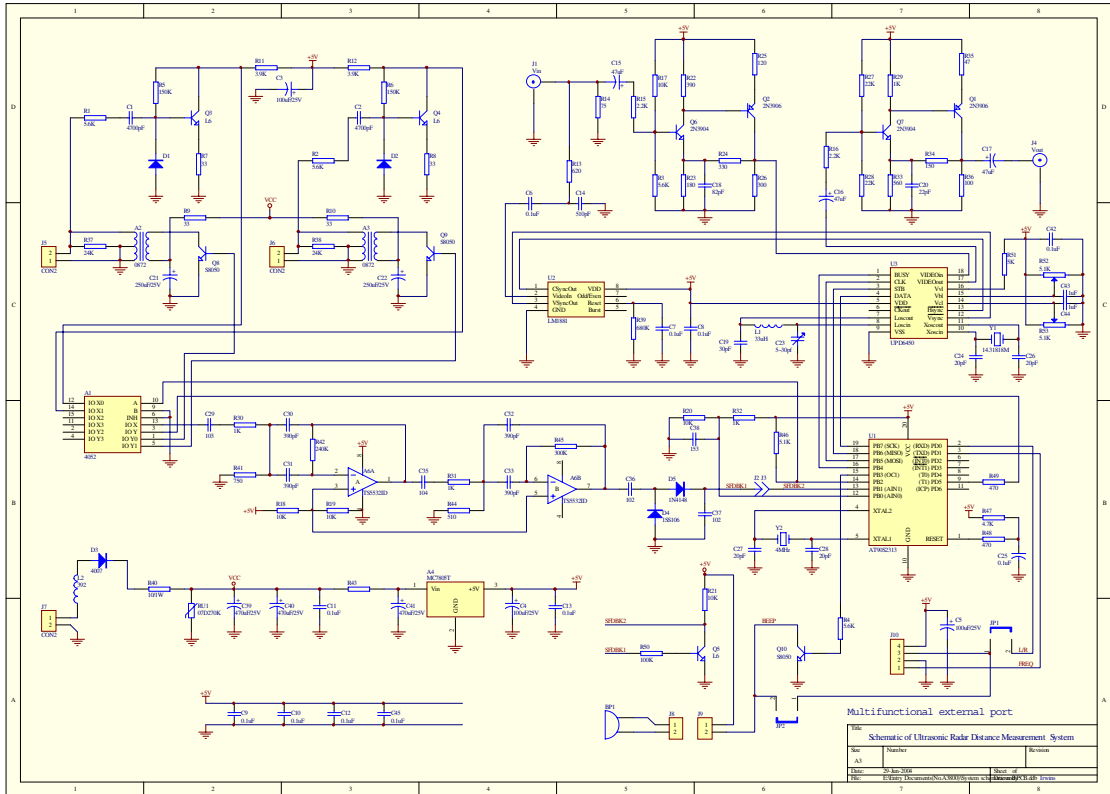


Figure.4 Schematic of main board

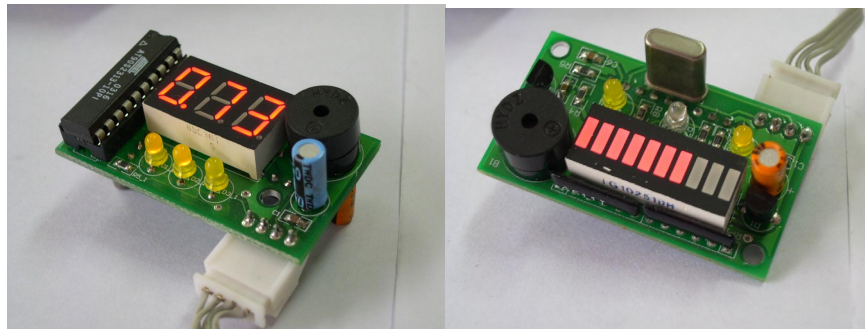
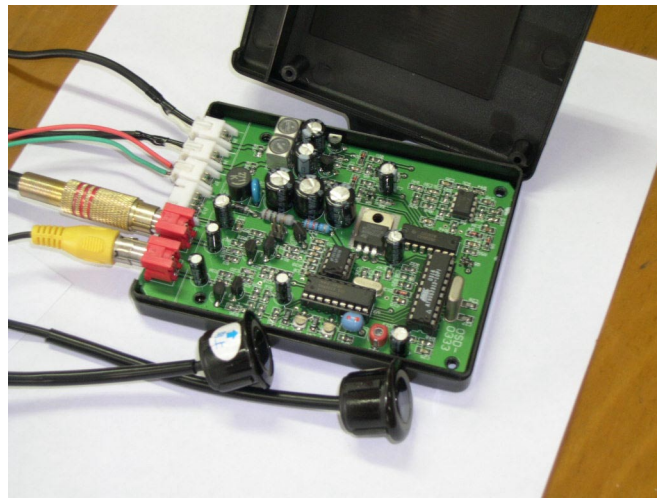


Figure.5 PCB of main board and external boards

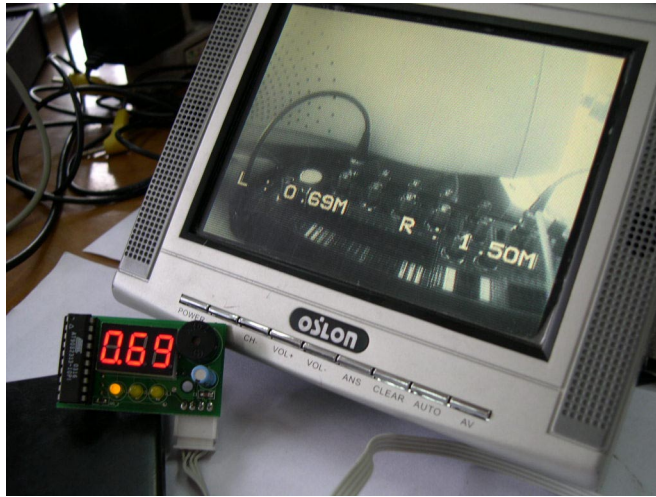


Figure.5 System at work

End of the abstract