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ARM9 Based Navigation System for Vehicles

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Abstract

Vehicle Navigation System is one of the most challenging works today. If any accidents happen then if we know nearest hospital, route to reach hospital then we can have more chance to rescue people. Our project is an attempt to develop Vehicle Navigation System using ARM9 Processor, GPS and Electronic Compass. Usage of our project can be to guide the sailor in ocean, guide tourists and guide taxi drivers in major and metropolitan cities. Here using the ARM processor and the embedded operating system WindowsCE as a development platform for designing navigation systems. The system uses GPS systems to obtain the latitude and longitude of the vehicles, by conversion and map-matching to get the actual location on the map, and then the user enter the destination, calculated the shortest path by A* shortest path algorithm and showed on the ARM processor. At the same time, direct of vehicle is extracted from electronic compass providing the direction of vehicle and displayed on the screen.

Keywords: ARM (Advance RISC Machine), GPS, Electronic Compass, shortest path algorithm.

Introduction

Along with the rapid development of India's economic level, the automobile industry has also prospered. Automobile's rate of growth goes far beyond the growth rate of road, automobile capacity sharp growth and the urban modernization transport's lag behind causes the urban transport situation to worsen unceasingly. At the same time, the requirement which the modern logistics need the safety of transport vehicles and cargo and time dispatching the management of the bus and taxi operations and large enterprises and institutions daily vehicle also has imperious demands on Vehicle monitoring and navigation. With the development of the tourism industry, people need a device that could know the location and destination anywhere.

GPS (Global Positioning System) has the feature of global, all-weather work, high accuracy positioning, multi-function and wide application, we can achieve accurate autonomous positioning through GPS receivers, which laid the foundation for the realization of positioning and navigation of vehicles. With the maturity of embedded operating system, path optimization control algorithms and GPS networks, the vehicle positioning navigation system has a new development, which could be realized the positioning and optimal path navigation in a short time.

The design of information system terminal used ARM processor and embedded operating system Windows CE as development platform, CPU operating frequency could be reached a maximum of 533MHz through the use of ARM processors, which makes the data processing capability greatly strengthened. At the same time, the developed and designed software based on embedded operating system Windows CE have a very strong scalability and stability.

Design Process

A. Introduction of function

The system of embedded GPS navigation obtains the longitude and latitude of the location by GPS, and obtains the actual position through the conversion and the initial direction from the electronic compass. Then the user inputs the destination. The system calculates the shortest path by the A* shortest path algorithm and displays on the vector map, at the same time, gains the speed information, the time information and so on provided by GPS ,and displays on the screen.

B. The hardware implementation

The core of hardware of the system of embedded vehicle navigation is the Friendly ARM processor which is the ARM9 series of 32-bit RISC processors. The powerful real-time processing

capacity and the abundant peripheral interface of the chip is very suitable for the development of embedded system. Friendly ARM processor having 64M NAND Flash and 2MB NOR FLASH with BIOS installed. The exterior of this system is added the GPS module used to receive the GPS signal, electronic compass is used to get the initial direction; the touch screen panel used display.

Figure :Friendly ARM kit for embedded development

Software Design

A. Software Data Design

The data of the Navigation software is mostly the spatial data of navigation map, and it is mainly made up of some navigation requirements information, including the geometry of the road network, road grade, road characteristics, cross-regulatory constraints, geopolitical boundaries, points of interests, road signs and service facilities. These data can be divided into two categories: the road network data and off-road network data. The road network data includes the basic geographic data of road network (such as road location information) and the data associated with the vehicle on the road (such as the information of the traffic rules, the charge information and the information of speed limited of the road).
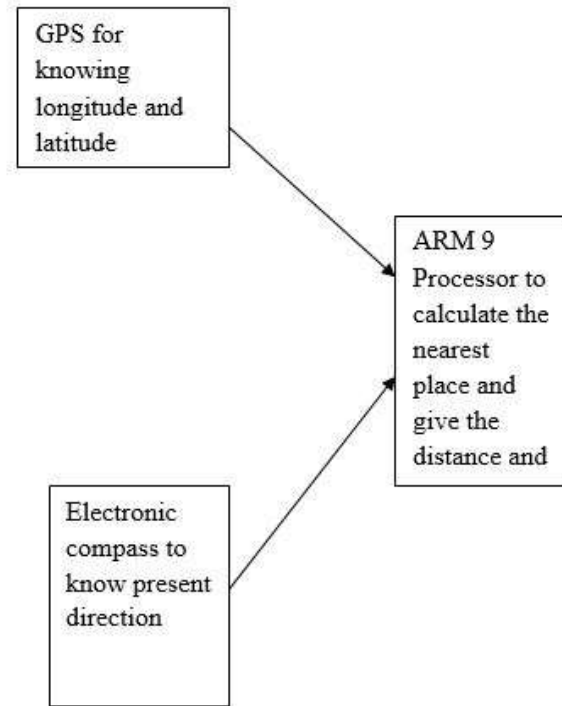

Figure: Block diagram of Vehicle navigation system using ARM9 processor.

The main feature of the road network data is strong topology relation. The off-road network data mainly includes the basic geographical information which can reflect the basic geographic appearance (such as river, lake, boundaries etc.)

Implementation

A. Current location of vehicle

Firstly by running the program which is loaded in the Friendly ARM processor we can able to get longitude and latitude of that particular position from GPS(Global Positioning System) by which we can able to find out the place of our vehicle for which this module is arranged.

B. Current direction of Vehicle

By running the code which is loaded in the Friendly ARM processor, by using electronic compass we can able to find out the current direction of Vehicle.

C. Nearest place calculation

we taken all known places longitudes and latitudes and stored in the Friendly ARM processor, by running the code which is already in the Friendly ARM processor we can able to find the nearest location(nearest hospital location).

Results

Current latitude=13.63033
Current time=10.30
Latitudes={13549913, 13.557357, 13.559072,13.536866}
Longitude= {78.509859, 78.509322, 78.509084, 78.501413,}
Location={"MLL Hospital"," Anadababu Hospital","Super Specialty MPL Hospital","Government Hospital"}
Current Location of person= dsp_lab
Nearest _Hospital=Government Hospital
Distance :8.45 Km

Figure: Friendly ARM kit showing results

Conclusions

In the navigation and positioning system, GPS is currently the world's most widely applied system, which functional roles have been widely accepted. There are many types of GPS receiver modules and great precision for options. It can select according to system requirements, volume, timing criteria. Moreover, with the United States canceled its SA policy to improve the navigation message output positioning accuracy, GPS signal has been received need not differential treatment from the Differential GPS stations, and positioning accuracy can also be at least less than 15 meters, which is completely adequate for the most of the civilian system. GPS is an all-weather system, have very few blind spots to work. Unless the space has been obscured more seriously, generally the GPS antenna can smoothly receive the GPS signal. At the same time, the technology has been extensively used in the products of related industries at home and abroad. GPS positioning system applied into navigation system has not only a high feasibility, but also a considerable reliability.

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