EMBEDDED LINUX BASED SHOPPING ASSISTANCE SYSTEM

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Abstract

In a view to streamline shopping system and facilitate access to required commodities among innumerable varieties in a super market, personalized service can be exploited in automated manner through interactive graphical user interface. Implementation of location based several touch screen modules with a centralized database can provide easy, accurate and timely information in regards to query generated by the users. Availability of an item and its location with absolute identification are displayed on the screen to facilitate users to get access to it immediately. This not only saves valuable time and cumbersome manual procedure in finding desired products but also provides an easy-to-use interactive shopping experience without any effort. Personalized Shopping Assistance maintains a centralized database for all products in the super market with user-friendly graphical user interface touch screen modules at various locations.

Keywords: Shopping Assistance System, Product Navigation System, Supermarket Kiosk for Customers, Retail Store Product Searching System, Embedded Linux based Indoor Product Navigation System

Introduction

Shopping malls or supermarkets are ideal environments to explore ubiquitous computing applications, as they integrate various technologies to support customers. Moreover every week thousands of shoppers enter supermarkets flooded with millions of distinct product choices, from which they will ultimately select a few dozen items, in about an hour or more.

Shoppers usually face difficulties in locating the products in the supermarket. This is either due to poor product recognition or due to an assumption that the product is located elsewhere. Secondly, customers have difficulties in recognizing the products, because of an already possessed assumption on how a product would look like or due to changes in product's visual appearance. They also face complexity due to brightly colored signs, aromas from various products fill areas, music, audio adverts, or announcements played in the store. Also, shelves are crowded with brightly colored products and packages. Most of the shops' physical layout encourages the customers to follow a U-shaped route, which demands the customers to go back to the same route again. All these sources compete to the customer's attention, making it difficult for them to efficiently move around the shop to locate the products. Shopping Assistance system is basically a touch screen based graphical user interface module. The requirement of the touch screen interface is basically to provide easier, faster and interactive access of data to the users.

When a user needs to search for certain items, he/she needs to select the Item Category to make access to the available list of brands present in the supermarket under that particular category. To make the GUI more interactive, a drop down menu will be provided for ease of search to the users. The location of the particular item will be displayed on the screen by highlighting the appropriate section in the specified map of the supermarket and also displaying the Section Name or Rack No. in a pop-up window.

In our project, we are trying to design and implement a location based shopping assistance service that allows shoppers to shop with ease and style. It consists of several touch screen modules installed at different places inside a super market. Shopping assistance unit will help users in locating products, speed their checkout, and make their shopping experience less frustrating. This system is intended to work for medium to large sized shopping malls and grocery stores.

Related Work

Several mobile context-aware systems and prototypes have been proposed e.g., K N Saranya REF[1] illustrates a method to locate the products inside grocery stores or shopping malls were intended to run over Wi-Fi, based on the hand held wireless communication device and a centralized server located in the supermarket or shopping mall to which the customer communicates. Kanda T REF [3] introduced robot guide in a shopping mall. The robot was designed to assist the users regarding their queries to locate the products. Field trial showed that 63 out of 235 people changed their shopping behavior and went shopping based upon the guidance from the robot. But each method that we read about had some demerits,

some methods used expensive equipments like robots, some methods used Wi-Fi which may require periodic maintenance. We tried to profit from the experience that other researchers gained in this particular field and added our own ideas to produce an application that is fast, robust, and less expensive.

Shopping Assistance Unit (SAU)

SAU is a standalone unit consisting of two components: hardware unit based on highly advanced ARM 9 core to which embedded Linux is ported and touch screen module to facilitate user interaction. Shopping assistance unit (SAU) will help users in locating products, speed their checkout, and make their shopping experience less frustrating.

Proposed Method

There are several techniques to locate the products inside shopping mall or grocery, like use of Wi-Fi indoor Environments, guide robot but all these techniques are little bit complex in comparison with our proposed method.

We plan to implement the project in Grocery stores, Supermarkets or Shopping Malls. The controller used can help to induce some intelligence by programming all the decision to be taken. The database will be stored in the memory. The query is provided by the user by choosing required item from the drop down menu consisting of various categories and brands. After getting the query from the user in the form of Category and Brand Name, the controller highlights the appropriate section on the specified map and displays the Rack number.

The following Figure 1(a) displays the touch screen user interface of SAU. It consists of the Category and Brand name drop down menu along with the map of the proposed store or supermarket. The Figure 1(b) and 1(c) describes the procedure to select the appropriate item. Ex. In this case, the user selects Category as Footwear and the Brand as Nike. This query by the user is compared with the available list of items in the database and highlights the appropriate section on the specified map. Also, it displays the Section Name and Rack No. of the particular item in a message box. This is displayed in the Figure 1(d).

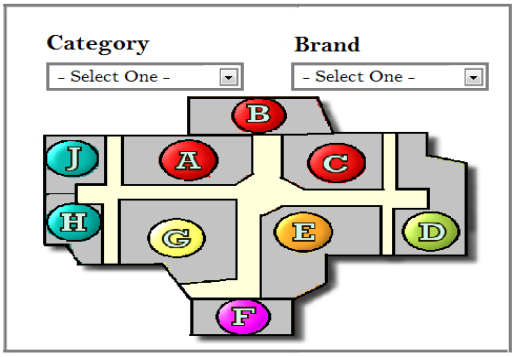

Figure 1(a)

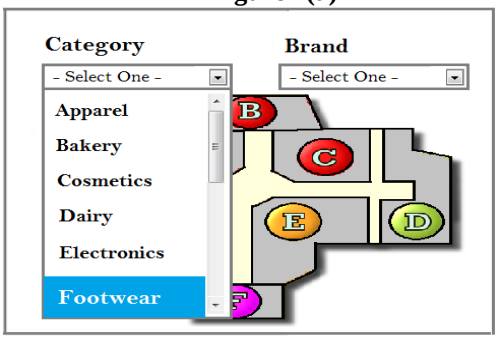

Figure 1(b)

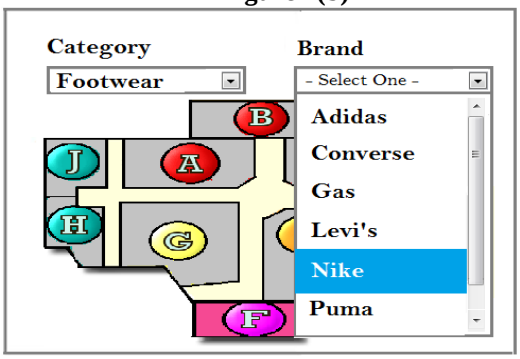

Figure 1(c)

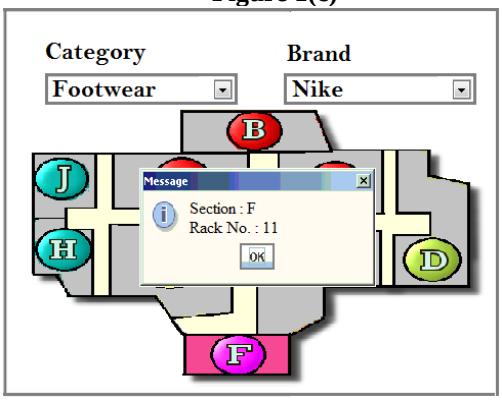

Figure 1(d)

System Specifications

Hardware:

Shopping Assistance Unit comprises of Mini2440 Development board. The Mini2440 Development Board is based on the Samsung S3C2440A (400 MHz) using ARM920T core. This ARM core acts as the heart of the system. It uses ARM V4t architecture i.e. Version 4 Thumb architecture. Highly advanced ARM 9 core has its own advantages like faster processing, excellent code density which is mainly because of Thumb technology. ARM processor provides OS support which plays important role for this particular application, while designing graphical user interface (GUI). ARM processors are well known for delivering high performance and low power consumption. Mini 2440 development board contains two flash i.e. NAND and NOR which are useful in bringing up the operating system onto the board.

Software:

To facilitate the user interaction with SAU, implementation of a GUI (Graphical User Interface) is an added benefit. Embedded Linux provides support for development of GUI. Since Linux is known as a stable operating system, it doesn't need to be rebooted periodically to maintain performance levels. Major reason to use Linux on embedded platform is its flexibility i.e. one can install only those components that are required for a particular application instead of installing the whole suit, which ultimately will save the disk space.

GUI development tool Qt is open source and is developed by the Qt Group (formerly Trolltech) at Nokia. Qt is a cross-platform application framework. GUI developed using Qt can be deployed across several operating systems without rewriting the source code. Also Qt increases the productivity by making C++ programming faster and easier. Full access to complete source code on all platforms enables developer to adapt and extend Qt to meet their unique needs. Graphical architecture of Qt as shown in the Figure 4 explains all about itself.

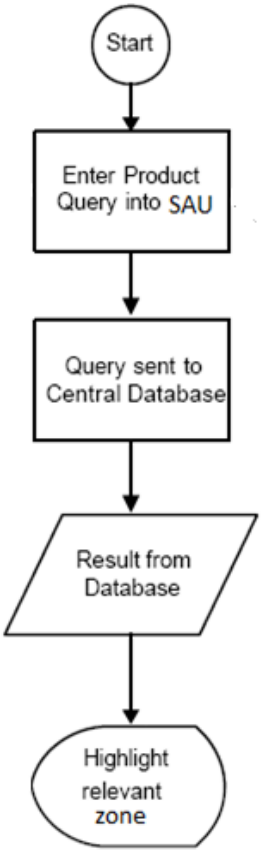

Figure 2: Product discovery flowchart

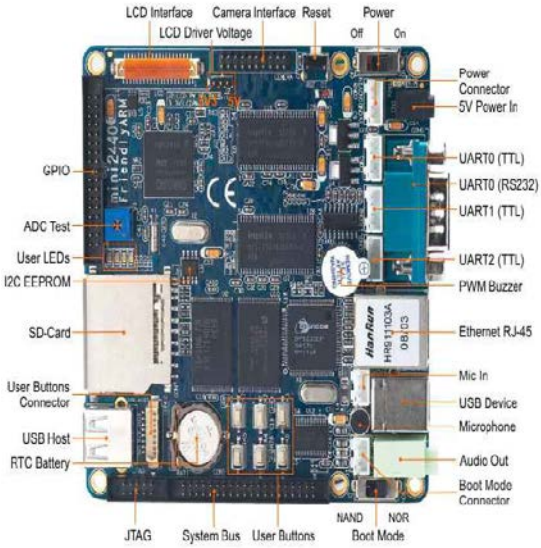

Figure 3: Hardware Unit

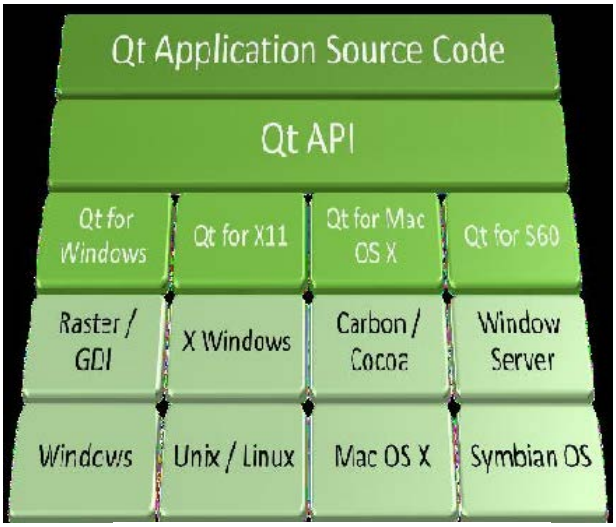

Figure 4: Graphical architecture of Qt

When a fresh board is powered on, stepping stone starts executing blindly a 2 k-byte code from the selected boot memory which is also known as start-up code. In the next stage, boot loader needs to be configured as per the hardware available on the board and then compiling it for the same board. Then the kernel is to be configured for particular compiler and architecture (hardware platform). It is then compiled. At this stage, the system has an OS installed on it and no external application running. For developing user interface, there is a tool named Qt. Qt must also be initially configured for particular hardware platform and architecture but this has to be done on the Linux PC. GUI can be developed using the application Qt Creator which uses C++ as its programming language. Finally after the development of the GUI application on PC, its executable file is to be copied to the mini2440 memory. This executable file is run on the mini2440 board which shows the GUI on the touch screen.

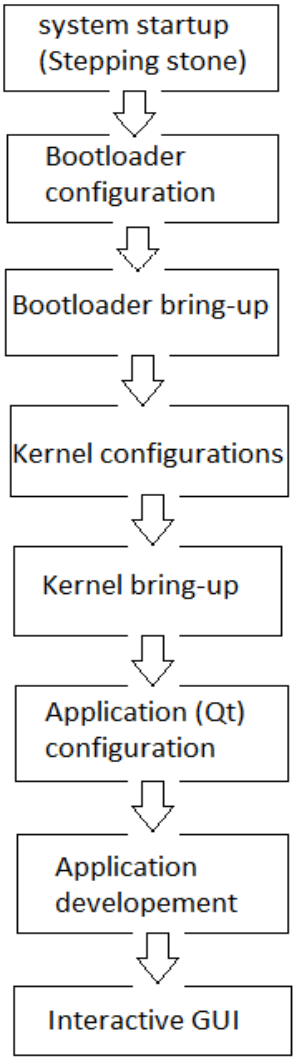

Figure 5: Implementation stages

Conclusion

Supermarket shopping is made interactive through SHOPPING ASSISTANCE SYSTEM as it enhances shopping experience by reducing the time spent inside the shopping mall. Also, it provides a shopping assistant service that is powerful enough to assist customers, yet simple for an average customer to use on everyday basis. Also the implementation of a GUI (Graphical User Interface) makes the product looks much friendlier.

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QT (qt.nokia.com)