INFOTAIN SYSTEM FOR AUTOMOBILE BASED ON BEAGLEBONE BLACK

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Abstract

Today's Automobiles require multiple advance features with a single touch, therefore there is a need for infotainment system which handles both Information and Entertainment. This project reports an Infotain system for Automobile based on Beaglebone Black development board by Embedding Android Operating System and Android applications on to the device. This infotain system is capable to play multimedia files, provide information related to the Navigation, and create access to the Internet. The main aim of the project is to build and customize the operating system according to the system requirement and developing application softwares for the Infotainment sytem. This process of refining and building operating systems and applications for a brand new boards is called Board Bring Up. Above reported Infotain system can be upgraded with different hardware modules for better features in Navigation and Communication, since the board is equipped with more communication interfacing ports. An voice guiding feature for driver using the map details, a Message popup feature which delivers the message to an control / monitoring center would be added in future.

Key Words: Infotain, Beaglebone Black, Navigation, and Sitara.

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1. INTRODUCTION

Infotainment system combines entertainment, multi-media and driver information functions in single module. They offer radio or satellite radio, CD/DVD player for music and video, navigation system, data and multimedia ports (USB, Blue tooth, line in, line out, video in) as well as general and vehicle status information.

A Navigation system is a system that aids in navigation. Navigation systems may be entirely on board a vehicle vessel, or they may be located elsewhere and communicate via radio or other signals with a vehicle or vessel.

Android is an operating system based on the Linux kernel, and designed basically for touch screen mobile devices such as smart phones and tablet computers. Programmed using C for the core content and C++, Java for interface of users.

1.1 Beaglebone black

The BeagleBone Black is the newest member of the BeagleBoard family. The BeagleBoard is a low-cost, fan-less single-board computer based on low-power Texas Instruments processors. It is a lower-cost, high-expansion focused development kit using a low cost Sitara ARM Cortex-A8 processor from Texas Instruments. The BeagleBone Black ships with Linux kernel 3.8, upgraded from the original BeagleBone's Linux kernel 3.2. Operating system for board are Android, Ubuntu, openSUSE and Angstrom. The board also supports other OSes such as FreeBSD, OpenBSD, QNX, MINIX 3, RISC OS, and Windows Embedded.

2. EXISTING MODEL

The existing infotainment systems are capable to play multimedia, providing access to navigation and vehicle status. Present systems use specific company's hardware module and operating system of respective company. The application for these systems would be prebuilt specifically.

2.1 Problem Definition

In the present day's the flexibility of the operating sytem and applications compatibility and availability of the applications is very important. But the existing infotain systems have very few applications supportable for the company's operating system. Other disadvantage of existing system is the size of the device would be quite large and some systems may have separate modules for entertainment and information, hence there is wastage of space.

3. PROPOSED WORK

The project reports an proposed approach of building an Infotain sytem based on android embedded system using beaglebone black.The block diagram of the infotain system is shown in Figure.1.The system contains a beaglebone black development board, user interface devices ,a micro SDcard in which the Android operating system and Android application is embedded and plugged into the memory card slot of the board ,an HDMI/DVI port compatible display device, audio devices (speakers).
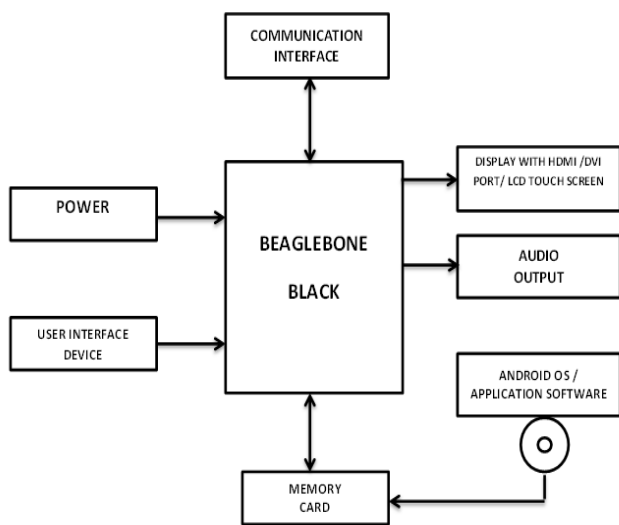
Fig -1: Block diagram of Infotain System.

Building the infotain system would include developing Android applications and building the Android operating system compatible for the development board.

Hardware requirements for building system :
1. Beaglebone black board (target system)
2. Personal Computer (host system)
3. User interface devices
4. Display devices and speakers
5. Micro SD card (loaded with OS and application)

Software requirements for building system :
1. Eclipse tool
2. ADT(Android development Tool)
3. JRE (java runtime environment)
4. Android Source Code
5. Ubuntu 12.04 as a Host Operating System
6. Android Jelly Bean 4.1 as a Target Operating System

The process of Building and customizing an operating system ,developing application software for an specific newly arrived board and making it work as per specification is called Board Bring Up. In this project building the operating system is achieved by executing commands in the terminal window on the Linux   operating system (host system).The procedure would include building stage 1 boot loader(MLO file),stage 2 boot loader(u_boot),building kernel file(UImage),building root file system(boot.scr) ,finally developing application and running on the core operating system.

Flow chart for the media player application is shown below in Figure.2.it shows the working of the mediaplayer application on the android OS .Media files stored in the sd card is loaded to the player initially , loading the buttons ,updating time and playing according to the user inputs.f the media file is playing pause button is loaded and play button loads if paused.the application checks any button (repeat,shuffle) is activated and plays accordingly.
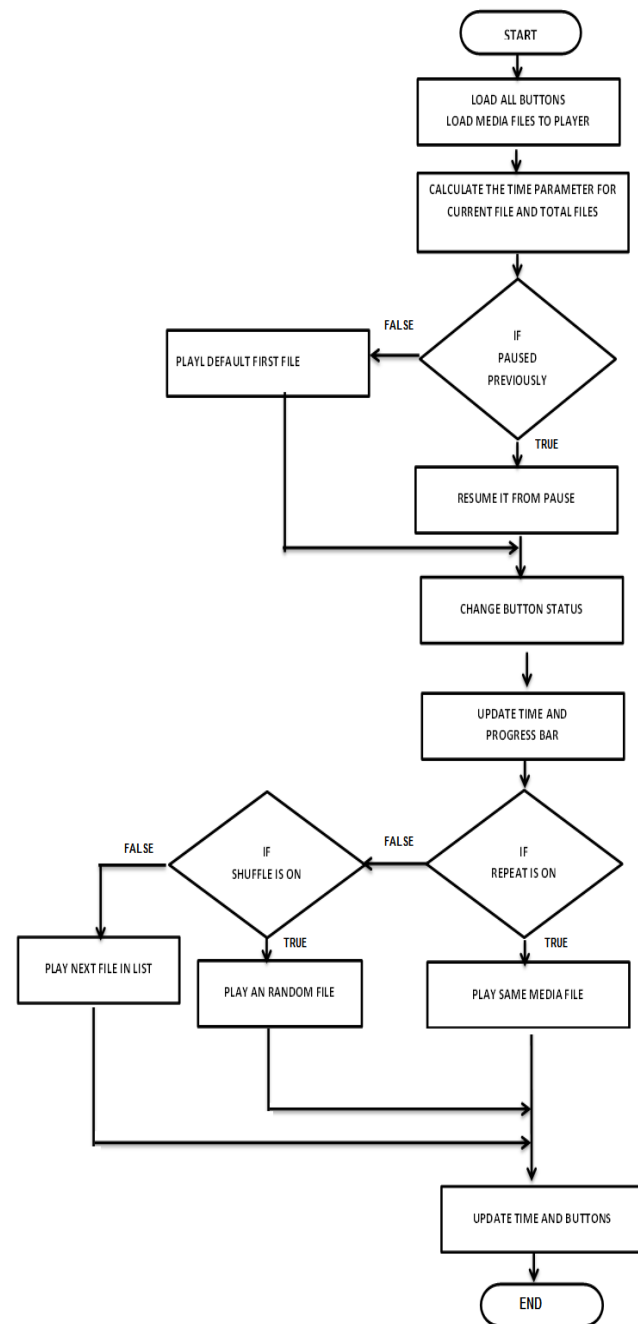
Fig.2. Flow chart of media player application

Flow chart for the Navigation application is shown in Figure.3.Once the application is activated the grid view of the map is loaded as predefined by the Google services, then it loads the graphical map view and buttons (GPS on /off),application displays the default location defined by the programmer by the help of the image frames stored in the database system. Application checks for GPS button on condition if its true then the GPS device is tracked and current location of the device is displayed on the device with a dotted mark indicating the current location on the map. Once the current location is pointed on map the application would load surrounding location around the current location .If the device changes its current position the GPS device is again tracked and updates the current location. If the GPS

module is not available or its switched off then application only displays map has the which user points through interfacing device.
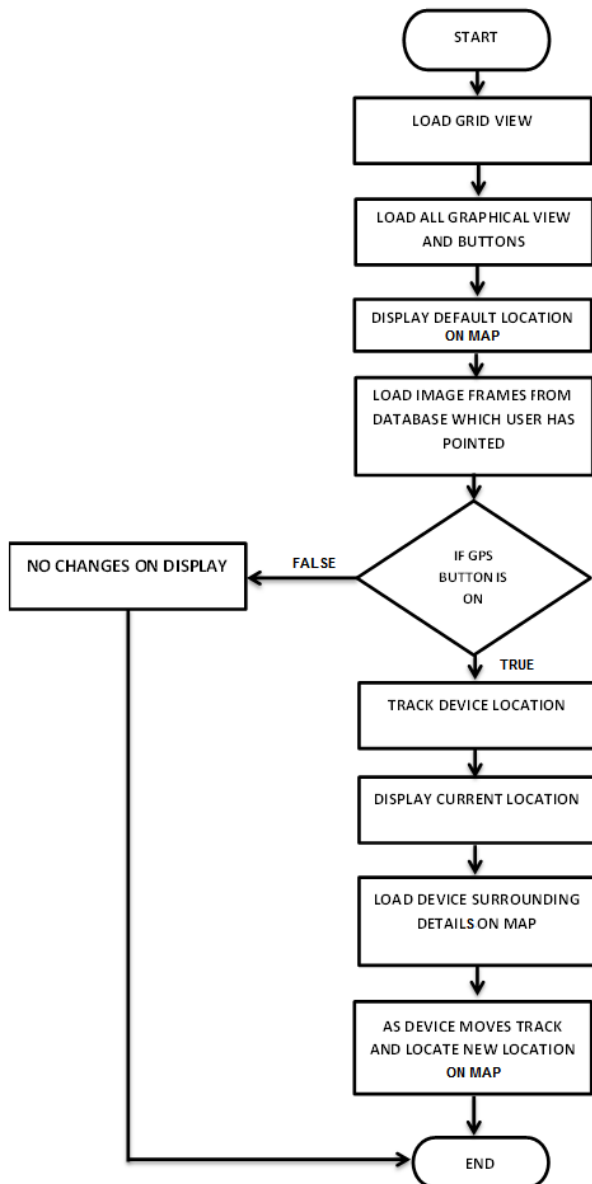
present location of the device(in case of this project it would be an automobile).The circular button present at top of the navigation screen is used for switching GPS device on/off. Zooming in and zooming out is achieved by swiping and tapping on the touch screen display device and dragging, scrolling for normal devices.
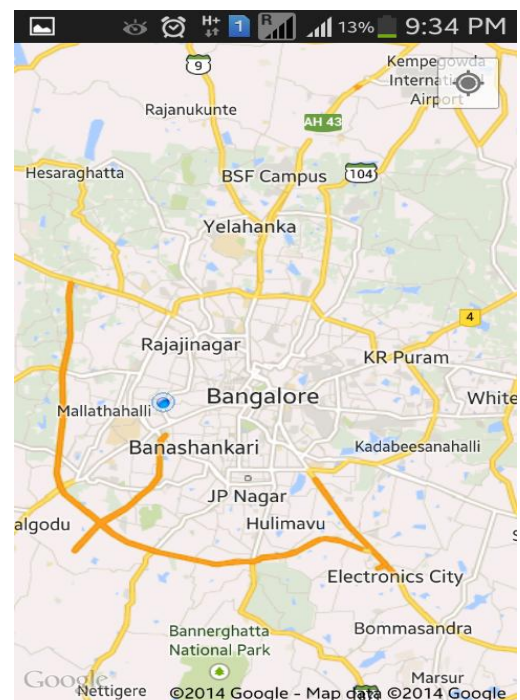

Fig.3.Flow Chart of Navigation Application.

Fig.4.Screenshot of the Mediaplayer application

Fig.5.Screenshot of Navigation Application

4. RESULTS

The proposed system was tested on the beagle bone black board by burning the operating system and application software which was developed on to the memory card of the board and the acceptable results were observed on the display device. The screenshots of the results is shown in figures below Figure.3 .In screenshot the image shows an media player which loads the media files from SDcard of board to player and plays according to the list created by the user. The buttons would be able to play, pause ,stop, forward ,rewind ,repeat, shuffle. The list button in the mediaplayer would show the mediafiles list loaded for playing..The screenshot shown in Figure.5.shows the navigation application used for tracking and locating the

5. CONCLUSION

The proposed system was built and executed on the beaglebone black development board successfully with best results. The scope of work can be extended with additional applications to use voice guiding and popup message feature based on map. Additional communication hardware modules like GPS, GSM etc can be interfaced in future for advanced communication features

ACKNOWLEDGEMENT

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