INSTRUMENT CLUSTER CONFIGURATION USING GUI BASED ON VB.NET

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Abstract: The purpose of the project is to design and develop a GUI (graphical user interface) based Driver information system. Instrument clusters are the traditional readout meters available in the dashboard of cars and motorbikes. In regard of the conventional meters that are in existence, the analog meters have disadvantages in lack of storage capability and accuracy whereas digital meters have display problems in dim light areas. In order to overcome these disadvantages the instrument clusters can be controlled and made user friendly with the help of GUI. Graphical User Interface allows the drivers to interact with instrument clusters using images rather than text commands and command line arguments. The goal is to enhance the efficiency and ease of use for the underlying logical design. These actions are usually performed through direct manipulation of the graphical elements. This can be implemented in instrument clusters with the help of .NET software along with the assistance of MS access as back end tool.

I. INTRODUCTION

The problem domain is identified to be in the dashboard area of the cars and other heavy vehicles. The dashboard is the one that has the instrument clusters which includes the speedometer, tachometer, odometer and other warning signs. These meters are now manufactured according to the vehicle manufacturer needs separately. This enables redesigning of the hardware components of the meters according to the real time speeds required by the users. Also other major factor which makes the design complicated are the varying tyre radius, rotating speed and the maximum revolution per minute of the tyre. So whenever these requirements changes in the user or manufacturer's part, the hardware designer of the meters have to make changes in the design of the meters. This problem can be rectified by the development of a common speedometer or tachometer which then can be configured according to the manufacturer needs. The basic idea is to enable the user manufacturers to enable themselves to configure their market products according to their desire of company standards. The speedometer or tachometer is developed for this purpose by having small changes in the hardware design. The hardware is developed in such a way that it is able to accept the settings from the user with the help of GUI. So in this paper we have encapsulated the development of GUI platform to achieve the purpose stated. The GUI platform is developed with the help of VB.net software.

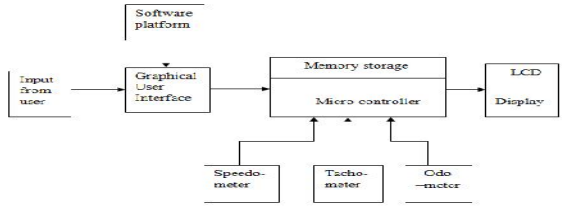

Fig.1 Flow diagram

As stated earlier the development of an instrument cluster using GUI is accomplished with the flow as in Fig 1.

In order for the user to interact with the system to be configured a GUI platform is developed. This is developed with the help of .NET software. The platform is framed as per the requirements and specifications needed for the users to modify their products.

As per the specifications made, the GUI proposes them to the microcontroller via serial communication. The various meters present in the instrument clusters are odometer, tachometer, speedometer, door lock indicator etc. The controller used here is Fujitsu microcontroller which is specialized for graphical operations in various automotives. These again interact with the microcontroller and display the readings in the indication meter. There is a memory present within the microcontroller which enables us to refer to the readings saved and can be acted upon.

For the GUI development, codes are written separately for every operation or specification to be fed into the hardware system. Separate logins are provided for the administrator and the user. The user can only work with the GUI platform whereas the administrator alone can modify and debug the platform needed. The software platform developed is verified using Softune for any bugs if present and they are corrected before being implemented for operation. This is the overall objective of the project and the entire process includes the use of both VB.net & MS access for database management.

II. DEVELOPMENTAL STAGES OF GUI

The fig.2 explains the developmental stages of the GUI till it is interfaced with the hardware. The can be developed using various application softwares available at present. The one which is been used for this project is VB.NET. The first step is to define the

requirements which need to be displayed on screen. The forms as appears when a project is opened can be designed as we require with various themes. So every single design requirements are formulated in this step. Various text boxes, combo boxes and buttons are placed in the form and the basic structure is drawn from this step. In the same way many forms are framed for each and every operation.

Following this step, in order for every page to move or shift to the next upon action, separate codes are written. The requirements are taken as input using the developed environment. This executable code is then to be loaded into the hardware where it is applicable. It is loaded using serial communication i.e. RS232 cable.

Once it is loaded into the hardware it is now configured and the specific development environment is thus created. And finally the design is implemented into the hardware. The user can now conveniently interact with the system.

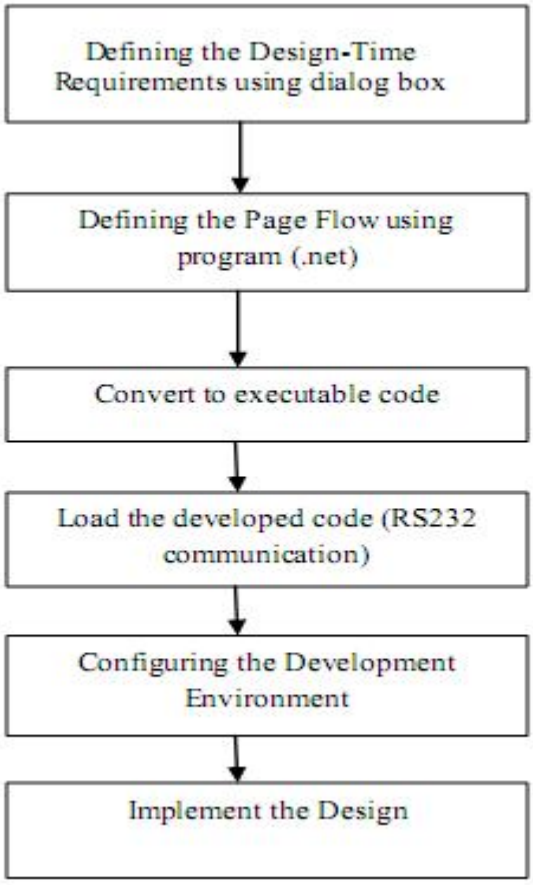

Fig.2 Developmental Stages of GUI

III. THE DESIGN OF SYSTEM SOFTWARE

The development of GUI using VB.NET is the primary operation. So once the work is completed this is how the working flow goes. The user can login with his own username and password. And the product name is required to be mentioned. Later every specification is given by the user in this GUI platform.

The various parameters that need to be mentioned or to be chosen are the port name, data rate, maximum speed, baud rate, stop bit and parity bits etc,. These are individually chosen from the provided options and the settings are saved. They can also be cancelled in the course of time if needed. If an invalid data is given then it will also notify us that the data is invalid and will ask for new data to be entered.

Once these setting are saved, they are converted into executable code to be written into the hardware. Further operation is carried out using Fujitsu microcontroller. It calculates the necessary requirements and displays using corresponding meters.

For example, here speedometer display is shown, where the frequency is measured using the following formula [4].

Frequency = (max speed X no of pulses per km)/ 360˚

The number of pulses is measured using sensors placed on the tyres of the vehicle. And this is given to the micro controller. It carries out the required operation and displays the result.

IV. THE DESIGN OF DATABASE SYSTEM

Microsoft has three traditional database programming modes: DAO mode 、RDO mode ADO mode. VB.NET carries ADO.NET in itself, which overcome many limits of ADO. ADO.NET adopt program that is provided by .NET trusteeship other than programs that are provided by OLE DB. .NET data provide programs act as the bridge between application program and data source. .NET data provide programs have the same function with OLE DB in ADO. They can make application program to read or write the datum which is stored in database. At present, ADO.NET supports three kinds of supplied programs: OLEDB.NET data provide programs; SQL Server.NET data provide programs, ODBC data provide programs [3]. As this system needs to quickly track and report information, having a rich user interface, and interactive design capabilities, Microsoft access database is used. The setup screen of the developed system with the necessary specifications and database connectivity is shown in Fig 3.

TESTING

TestPartner provides functions for testing GUI and non-GUI components. It can be used to test client or server side COM objects through scripts written in Microsoft Visual Basic [2]. AUILibrary, built based-on .NET, provides rich and powerful functions for GUI automation testing development and also it can be used on .NET platform by VB.NET and it breaks a number of bottlenecks of the current testing tools.

Petri- nets tool framework allows the rapid prototyping of an animated synoptic application associated with an embedded system controller [1]. This enables to automatically generate controllers with associated graphical user interface (GUI) without writing a line of execution code; instead, the tool framework will provide specific aids allowing the designer to define the controller behavior and associated GUI.

CONCLUSION

This user friendly environment for a particular configuration of every individual parts of an instrument cluster is to be succeeded. This entire process is accomplished using various software for development, management, testing and debugging as discussed in the paper. The most constitute configuration part of the GUI is shown in fig.3 which is the proximate specifications required from user of the platform.

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