Automated Testing of the Features of Infotainment System on the Basis of Graphical Human Machine Interface

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Abstract— Infotainment systems in automotive are getting more features in recent years, because of these features the complexity of testing the infotainment system is increasing.It requires large amount of human effort and time for testing and generating test results for various features of infotainment system, it is very difficult to test certain features with very high accuracy. This paper presents an method of testing various features of infotainment system on the basis of graphical human machine interface which does not involve tester to perform testing of infotainment system features. Using the method presented in the paper it is also possible to generate the results or the Logs automatically.

Key words: multiband antenna, inset-fed, GPS, WLAN, X-band satellite communication

I. INTRODUCTION

A HMI (human-machine interface) of an infotainment system is the interface, through which the user communicates with the infotainment system [3]. Latest car involves infotainment system which support number of features such as Bluetooth, Wi-Fi, Voice Recognition, Navigation, Radio, Media and many more, these features keep evolving and the complexity of the HMI software is growing with the increasing number of features supported by the infotainment system [3], because of which it is very difficult to test various features of the infotainment system with very high accuracy.

There are various methods of testing these features and some of them are, manual testing, where tester tests whether all the features of the infotainment system are as per the requirements, the Test designers who carry out manual testing have to spend a lot of time for defining the tests ,tests procedures and adapting the existing tests (already defined for a variant of infotainment system) for different system variants and software updates which is carried out regularly. The testers have to execute the tests step by step manually and it is time consuming. For foreign-language systems testers are in demand, who have to be native-speaking and also skilled at testing. The absence of native-speaking testers could lead to a low test coverage and hence more errors at end customers.

The other method is to use a robotic arm which manually touches the screen and the buttons of the infotainment system. The disadvantage with this methodis, a robotic arm has to be designed which will involve high cost and also time in designing it. These disadvantages can be overcome using software method of testing the infotainment system as explained in this paper.

II. ARCHITECTURE.

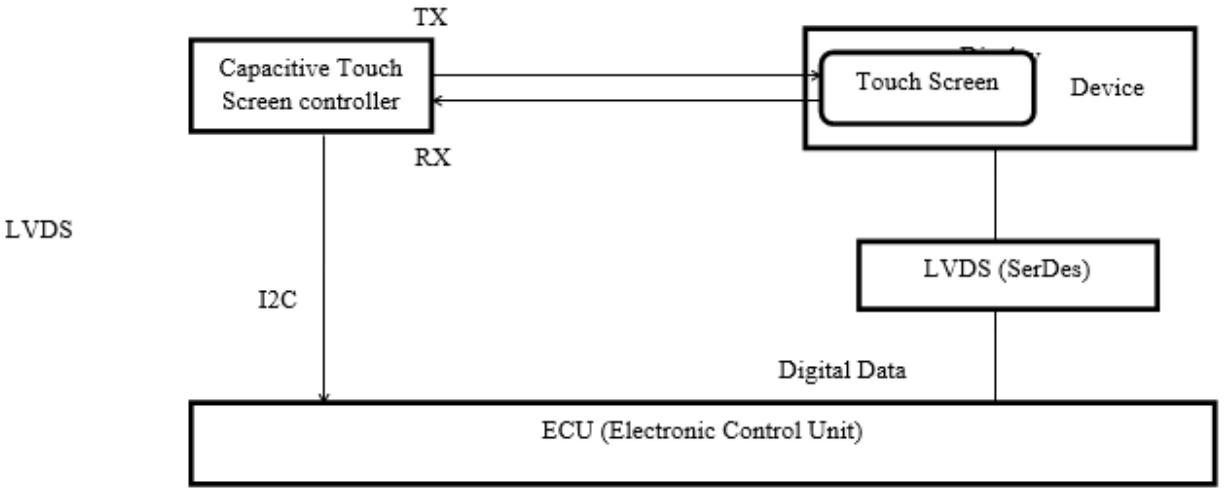

Fig. 1: General architecture (partial)of the infotainment system for the purpose of automation.

In Fig. 1 the capacitive touch screen controller senses the portion of touch on the touch screen and sends the appropriate information to the ECU (Electronic Control Unit). The Touch screen controller consists of an analog front-end(AFE) block, and a digital block[4] . The AFEdrives TX signals, senses RX signals, and interfaces to the digital block [4]. The ECU, depending on the information received from the capacitive touch screen controller, performs the corresponding operation. The output of the ECU will be digital data and this data is converted to LVDS (Low Voltage Differential Signaling) standard using LVDS SerDes (serializer/deserializer), the information is then transferred to the display device.

III. PROPOSED METHOD

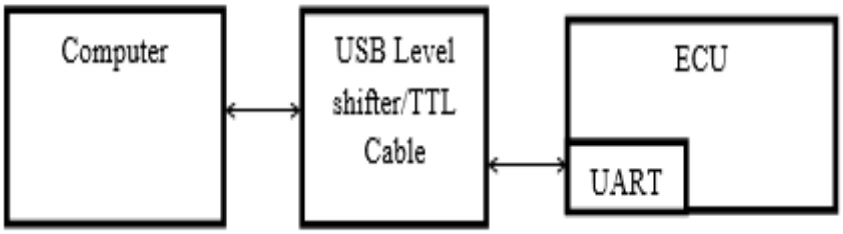

Fig. 2: Architecture for the proposed method

Fig. 2represents the proposed method, here the computer directly communicates with the ECU instead of a touch controller communicating with the ECU, using serial communication. The computer system itself sends the necessary information to the ECU. An USB Level shifter or a TTL cable is used as a medium for communication between computer and ECU, the computer uses a tool called Logger which is configured to communicate with the ECU and it is also used to store the Logs which contain information of the processes running in the infotainment system. From these Logs one can track for the defects in the features and it is also helpful for quality check of the infotainment system. TCL (Tool Command Language) scripting is used to perform testing of various features of infotainment systems.

IV. RESULTS & DISCUSSIONS

The above method for automated testing of infotainment features has been implemented. The script containing the command to turn on the radio application was executed and the result, whether the application is turned on or not was displayed in the Logger. As there was no fault, only the processes running in the infotainment system was displayed in the Logger (it can also be programmed to display something if there was no fault). If there was any fault, then that fault would be displayed in the Logger. Logger also provides the option of filtering the desired faults. With the help of the Logs displayed in the Logger it is possible to track the fault and it also helps in quality check of the infotainment system.

V. CONCLUSION

The proposed method for automated testing of the features of Infotainment system has been implemented and the proposed method is more advantageous when compared to other methods such as testing done using robotic arm or manual testing . Using the proposed method it is possible to test the features of infotainment system automatically (without human intervention) with very high accuracy and the results are automatically saved in Logger and using the Logs it is possible to track the faults and also helps in quality check of the infotainment system.

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