ISSN:2320-0790

An International Journal of Advanced Computer Technology

Archiving data from the operating system Android

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Abstract: The aim of the article was to create applications in LabVIEW which is a comprehensive development tool for application design using graphic symbols that are associated to the functional units. We were dealing with LabVIEW itself, its advantages and disadvantages, as well as the components used to create the applications. The application we created is used for data storage from devices using operation system Android. This operating system designated standardly for mobile devices has undergone an analysis mostly from the perspective of system structure. The last part deals with the development of application in which a closer analysis of its individual functional blocks was made. The conclusion of thesis deals with a fulfillment of the identified goals and possible improvements of the application.

Keywords: LabVIEW; Android; mobile devices

I. INTRODUCTION

Mobile phones have become an ordinary part of every man living in our modern society. Practically, we can be in contact with family, friends and business partners anywhere in the world thanks to the mobile phone technology. Over time, mobile phones have changed to small computers and this meant a new mobile phone operational system. At present, the operating system Android from the corporation Google Inc. is the most widely used operational system for mobile phones. Smart phones can be used for any reasons, from simple text writing, taking pictures and recording videos, to comfortable Internet access. Since these devices are mainly appointed to one user, naturally it means that they contain data of personal nature which can be lost or stolen relatively easily if the user is not careful enough. The loss of recorded memories, contacts or valuable information is always better to prevent and thus avoid regaining them back. Data backup is the basic way of data protection. It brings certainty that in the case of device loss or malfunction our data will not be lost and we will be able to restore it anytime. The users´ needs are different and there are various possibilities of data backup even from mobile phones.

The word "virtually" more and more frequently appears in context with new technologies connected with the fast development of information technology. We can meet virtual reality, as part of the show-business (film, computer games), or as the means facilitating coping with complex situations in certain fields of human activity. Our lives are entered by an offer of goods in virtual department stores displaying their goods by means of Internet in the so-called e-shops. Another area, connected with the word „virtual“ and the beginning of new technologies, in connection with measurement and measurement technology is called virtual setting.[1-5]

Measured data obtained from the virtual measuring devices (virtual instrument) can be further evaluated using the methods of exploratory and inferential analysis and the other analytical methods.[2-4]

II. CURENT SITUATION

Programming and evolutional environment LabVIEW is a product of an American corporation National Instruments. This corporation is an innovator and the biggest producer in the field of virtual instrument, technical discipline which is now in a period of a great development in evolution, research, education and industry.

The main aim of the virtual instrumentation is to replace temporarily or permanently spatial, costly and often time-consuming use of hardware technical resources by virtual software resources. This kind of solution enables quick design of new applications and making changes in configuration which is usually

expensive or even not possible when it is actualized by real instruments with the help of real components. LabVIEW is not appointed only for programming systems, signal measurement and analysis, control and visualization of technological processes with various levels of complexity. It is also designated for programming of complex systems for various purposes. LabVIEW environment is also called as G-language, i.e. graphic programming language. [6]

A. Android Operating System

Android OS is a wide-ranging operating system based on an open source platform, i.e. it is a PC software with an open source code. User can use the software for free, and after fulfilling certain conditions, license policy enables him access to source codes which he consecutively uses and modifies according to his needs. Consequently, all code changes have to be accessible under the same license. [7]

The system is built on a Linux core which is using its own virtual device ensuring system security as a whole, memory management, process management, access to network and to all internal sensor and component control. Each application to functions of the core is not approached directly but via Android API. Consequently, Android is a progressive operating system primarily developed for mobile devices (smart phones, PDA, navigation, tablet). It was built and constructed from the bases which enable the innovators to create impressive mobile applications. These applications then enable to make full use of all features the device offers. [8]

While developing the system, restrictions were taken into account what these classic mobile devices have, such as battery life, less processor power, and less available memory.

Simultaneously, the Android core was designed for operation on varied hardware. Thus the system can be used regardless of used hardware, size or screen resolution.

The Android platform itself makes available not only the operating system with user interface for end users, but also the complete solution use of operating system (specification, control, and so on) for mobile operators and for mobile device producers. The last but not least, for developers of applications it provides efficient instruments for their development – Software Development Kit. [9]

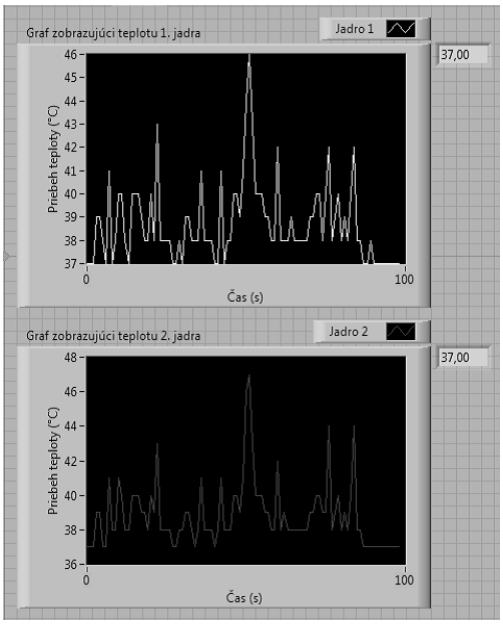

Fig. 1 Android OS Structure [10]

II. APPLICATION TO ARCHIVE DATA FROM MOBILE PHONE

The paper discusses the problems of creating an application in the environment LabVIEW for a mobile phone with Android operating system which is able to archive and to process information from mobile phone. The application should offer the user simple and efficient interface.

To ensure this task, it is implicitly necessary to choose an appropriate way of connecting a smart phone with a PC taking into account the possibilities of evolutional environment LabVIEW and the user´s abilities to carry out such a connection. The task can be divided with these sub-aims:

1. Realization of a functional communicational connection appropriate for data transmission between smart phone and PC.
2. Gain access to directory structure and to smart phone files from system Windows.
3. Provide the user a possibility to choose a precise file or directory which he wants to back up and, consequently, the application copies the specified data to a pre-determined location in the PC by the user. Requirement of an application is a bidirectional communication, i.e. data from smart phone can be transferred into PC and vice versa.

In UML language application requirements can be specified and divided as functional and non-functional. It is supposed that the UML language is well known so there is no need of description.[11, 12]

TABLE I. FUNCTIONAL REQUIREMENTS FOR APPLICATION

Requirements	Priority
System enables connection with the phone by entering its IP address and port.	Must
System enables to log in to FTP server running on the phone by user name and password.	Must
System informs about communication establishment with the phone.	Should
System enables the user to create new directory in his phone and PC.	Must
System displays the memory content – its directory structure.	Must
System enables the user to choose a target location in his PC where data should be archived.	Must
System enables the user to choose data in his phone which he wants to be archived.	Must
System copies the chosen data from the phone to target folder.	Must
System informs about the progress of copying and moving files.	Should
System displays the size of the copied file.	Should
System displays the view of the specified files.	Must
After finishing its activity, system disconnects FTP link.	Must
System enables bidirectional communication between the phone and the PC.	Must

Fig. 2 FTP Server Application settings

III. APPLICATION DESIGN IN LABVIEW ENVIRONMENT

For mobile phone connection, there was a need to find an appropriate way to make the data from phone to another system accessible, in this case to Microsoft Windows. Representing the typical service client – server, file transfer protocol FTP was used. In this case, the client was represented by local PC. On this PC, commands were running which initialized connection and performed operation with files and directory, and disconnected the link. Mobile phone had the role of the server what had been achieved by creating the FTP server using one of the number of third part accessible applications in the Google Play shop. A connection was created between the client and the server and then the file transfer might have started. During creating a connection, the client had to convey login and password to server. File transfer is thus a secured service.

A. Application for FTP server creation

The FTPServer application is freely accessible for any user of a smart phone with the operating system Android in Google Play shop. The last free version 2.8.1 was used, released by Andreas Liebig. The purpose of the application was to create FTP server in the mobile phone that served as a bidirectional file transfer via FTP protocol.

From the offered settings, user name, password, default directory and port number was used where the value of the port number could not reach 1023. As default directory, it was optimal to set the root directory of the phone. However, it depended on the user´s authority to have access to protected system directory. For example, the user needed access only to external SD card; it was enough to choose default directory /mnt/sd-ext. After saving the settings in the top row of the application, the IP address of the telephone displayed with the port number.

B. Front Panel of the Application

The graphical part of the application was designed through front panel of the LabVIEW package on which elements of displaying and controlling were placed. By these objects it was possible to control the application progress, specify parameters, and gain resultant information. Front panel of the application and the placement of displaying and controlling elements are shown in Fig. 3.

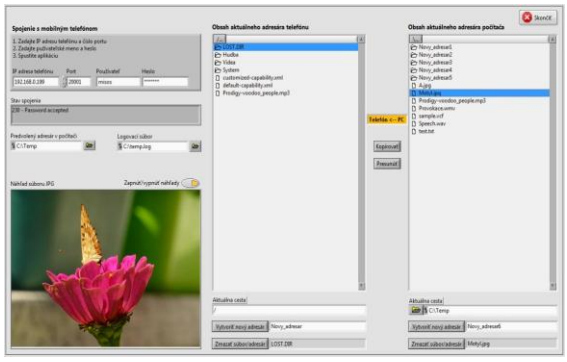

Fig. Front panel of the application

The basic condition for successful application communication with the mobile phone was that both the phone and the PC, on which the application was running, were connected to the same Wi-fi network. Also it was supposed that the FTPServer application was launched correctly configured on the phone.

Before starting the created application, the user had to enter IP address, port number, login and password. The value of the port and IP address was displayed by FTP Server application on the phone. Login and password had to be identical as they had been entered during configuration of the mobile application. Optional parameters were Default directory in the PC and the way with the name of the log file.

After starting the application, the indicator Connection status displays information about a successful or unsuccessful connection. As the titles suggest, in the windows Content of the current phone directory and Content of the current PC directory, corresponding lists of directories and files were loaded. Items in the lists are marked with the left button on the mouse or by arrows on the keyboard.

C. Block Diagram of the Application

The program part of the application was solved via block diagram of the LabVIEW package. Element placements were designed and, consequently, their input and output connecting points linked by data connections. Elements of the block diagram were bind with elements of the front panel. Programming environment LabVIEW is based on the principle of data flow control. As basic structure of block diagram, Flat Sequence structure has been chosen which enables progressive performance of the each part of the application – frameworks in an order from left to right. Data among the framework structure was transferred through data tunnels. Data was transferred from the framework after performing the program in the framework. The task of the first framework was to define the value of the variables, creating and begin a connection with the mobile phone, creating a log file, and information registration about the created connection. The second framework performed the activities of the application such as abstracts of memories, file and directory report, and the operations concerning them. Abstract of current phone and PC directory content and the change of current phone and PC directory were block diagrams which were managed over time and performed periodically. Other functional blocks were implemented by user interaction mainly by clicking the subsistent control placed in the front panel. Its performance was secured by Event Structure. The last framework of the application performed the disconnection of the active link, registration of the last information into log file and a correct log file close.

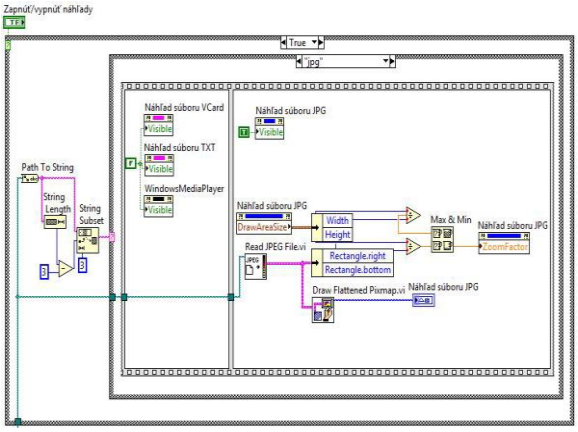

Fig. 4 Part of block diagram – generating JPG file view

IV. CONCLUSION

The paper discussed the problems of creating an application in the environment LabVIEW for a mobile phone with Android operating system which is able to archive and process information from mobile phone. In our opinion, the stated objectives have been achieved. The application displayed the content of mobile phone memory; it was possible to copy it into PC and vice versa. It enabled the user to create new directories, transfer files or delete them. Information process lay on displaying image, text, audio and video files preview and Vcard files containing data from phone directory.

A practical test of the application was testing the speed of copied data from the phone and vice versa. During transferring bigger files, there were no problems recorded. Transferring files of 903 MB from a mobile phone into PC lasted 6 minutes and 20 seconds. The real transfer rate was measured as 2,376MB/s which referred to the value of 19Mbit/s. In comparison with theoretical maximal transfer rate 54Mbit/s of IEEE 802.11g standard, it was an adequate result. In the case of copying the same file in the opposite direction – from Pc to phone – the transfer lasted 12 minutes and 10 seconds. To compare it with the previous rate it was almost twice the value. The transfer rate could be increased by using a router supporting the IEEE 802.11n standard. The application is fully exploitable even with the used means for normal backup of mobile phone content.

ACKNOWLEDGMENT

This publication is supported thanks to the project UGA VI/37/2013 Implementation of interactive tests in the form of didactic tests in virtual learning environments, Faculty of Natural Sciences, CPU Nitra, Slovakia and the project UGA VI/35/2013 Simulation and modelling of control algorithms in static systems.

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