



Európska únia



Establishment, Development and Scientific Management of a Research Center for the Analysis and Protection of Data

The main objective of the research intention is to apply acquired knowledge and infrastructure for solving new research objectives related to the topic of Smart-life and life in smart city to ensure a high level of quality of life in modern society.

The basic themes include improving and informatization of solutions of life situations of a regular citizen. The aim is to create opportunities and appropriate tools for the use of technological equipment of citizens, who daily use smart-phones and tablets or PC. Design and creation of a concept of integrated city management will provide simplification of solving official applications, documents transfer, communication between city and the public or it will provide to citizens their own cloud equipment for certified storage of official documents in electronic form. Through the constructed sensor networks the environmental and supplementary data will be concentrated, which will contribute to improvement of the environment and outdoor life. By creating of an image of the existing state of pollution, dust, noise, heat leakage, large concentration of water or hazardous gases it will be possible to implement instant interventions to ensure the health and safety of citizens.

One of the partial objectives of the project is establishment of complementary infrastructure for the implementation of research activities in the field of smart city and smart life. It includes the development and implementation of smart city platform modules, design and development of tools for communication of citizens with platform and its application to life improvement in spheres of resolving of citizens life events in the city and creating of information space for other services, for example the of health service, transport, energy, tourism and others.

Research center establishment for analysis and data protection, implemented in cooperation with IBM International Services Centre, Slovak University of Technology in Bratislava and DWC Slovakia together with running pilot research tasks was from a strategic point of view a beginning part of building the complex infrastructure serving the demanding research and development

activities with orientation to mobile data security. The research work was distributed into work packages together with an external research, where the data security areas daily affecting public life were analyzed. Data security is one of the issues resonating in the IT and hardware development with regard to the everyday use of tens or hundreds of millions of personalized devices (smartphones, telemedicine, e-government, social networks, etc.) by EU citizens.

Information technologies are intensively used to computerize systems and services in almost any area of human activities with the aim to increase their quality. In such systems and services often more than one user is involved, including a customer. The users are performing a sequence of causally dependent activities in order to achieve the goal of the service. Such a causally ordered sequence of activities forms a workflow process

WORK PACKAGES

WP1. Process mining and process identification

In the area of WP1 the main goal was to study the questions of process mining, process discovery and process learning, with the result to design algorithms for automatic, adaptive, computer assisted generation of models for information systems for workflow process management (business process management systems) and decision support systems. For validation of methods and algorithms in WP1 several reference processes both from public and private sector were used.

WP2. Energy Efficient Trajectory Prediction

Behavior detection is challenging due to its energy requirements. To obtain coherent information on user location, a number of sensors needs to be active, this in turns can lead to battery depletion. Within this work package, we implemented an Android application “FunFi” that allows us to collect various network as well as location information. FunFi was tested on a set of roughly 500 users. Based on the collected information, we designed and analyzed an algorithm for user behavior prediction with the focus on user trajectory prediction. Deviation of a user from a predicted trajectory can be perceived as an error that needs to be detected in a timely and energy-efficient way. Unlike other prediction approaches, our approach is based on a one-time trajectory probability computation; these probabilities remain unchanged over extended time period, what simplifies implementation of this approach as a web service. Other than trajectory prediction, this approach also allows for mapping WiFi routers to logical locations. This allows us to acquire user location with respect to a WiFi router nearby.

WP3. Mobile Information Security and Privacy

Mobile devices are still gaining popularity and transforming the whole field of information and communication technology. With the positive effects of these changes come hand-in-hand the emerging new forms of cyber-crime and misuse of data. We concentrated on private, personal, and otherwise sensitive or secret data (further referred to together as sensitive data). We focused on the possible ways of disclosure and leakage of sensitive data and on the use and misuse of sensitive data. Sensitive data stored on mobile devices lacks adequate protection. Furthermore, mobile devices themselves generate sensitive data, such as location and its history. All such sensitive data may leak from the devices due to unintentional reasons, such as poor development practices, as well as due to intentional malicious activities. The intentional privacy-breaching activities are of two kinds, namely, targeted malicious attacks (for example, malware, spyware, ransomware) and advertisement or marketing tracking and spying (for example, adware, tracking, profiling).

WP4. Biometric Recognition

This work-package dealt with the issue of creation of biometric recognition system. It was necessary to implement a complex recognition system composed of the input image pre-processing module, feature extraction module, and classification module. The methods chosen for these modules are sophisticated machine learning methods. Parameters of each method were optimized for increasing cognitive success and ability to work in real time.

WP5. Smart Monitoring of Bio-physical Parameters

Modern sensor networks based on the latest technology of wireless data transmission help collecting data from many sources and maintaining human health. Sensor networks, with their wide range of options, provide a wide spectrum in the range of biometrics and health care, the environment, smart buildings, the automotive industry and other economically important sectors. Basic level data collection between sensory units of networks currently represents one of the key points of information transmission integrity. There was research of new methods for integrating the sensing elements in the smart-electronic microsystems and new measuring stations were created within the project. Those are suitable for recording human biosignals with the ability of transmitting data over wireless networks to a collection point. New sensory stations include inertial measurement unit with high sensitivity motion measurements along with the possibility of monitoring of everyday life environmental variables in contemporary surroundings. The results achieved in the range of the sensor elements and networks, may in future research activities contribute to the design and implementation of smart-life - improving the quality of citizens life and the development of city intelligent management.

Structure of Research Center for the Analysis and Protection of Data

[IBM International Services Centre, Ltd.](#)

[Slovak university of technology in Bratislava](#)

[DWC Slovakia, Inc.](#)

A team of representatives from all partners of the consortium coordinated the inputs and concluded the final text. The members were: Igor Kazlov (IBM), Martin Donoval (STU), Gabriel Juhás (STU), Martin Vívodík (IBM), Martin Domin (DWC), Martin Drozda (STU), Michal Šramka (STU), Dominik Sopiak (STU) a Peter Satury (DWC).

Project outcomes

Research outcomes

- Data security of a modern city
- Secure network (biometrics, environmental)
- Behavioral models and patterns
- Integrated modular system offering a broad spectrum of urban governance
- Quality of life

Commercial outcomes

- The platform for use in other cities (modified platform for cities to 100 000 inhabitants)
- Cloud platform for small towns (implementation in dozens of towns)

Project Objectives

- Document flow in local municipality, document flow in health service
- Document flow in life situations in the city
- Open data standard for further use