Advanced Systems for Prevention and early detection of forest fires „ASPires“

Recently a lot of projects (including EU projects) have been started in computer-based forest fires early detection and monitoring, and are usually implemented in areas of particular importance (National Parks).

However, forest fires still present one of the main risk, and its detection in early phase remains one of the biggest challenge for researchers and institutions in Crisis Management Systems in Europe.

The project will develop a novel model of an information systems for early detection, monitoring and prediction of forest fires in areas of particular importance, providing high fire danger forecast and prediction.

The goal of the project is to develop advanced concepts for early detection systems of forest fires that integrates sensor networks and mobile (drone) technologies for data collection and acquisition of those data at existing Crisis Management Information Systems (CMIS).

The mobile (drone) technologies will allow to cover much larger areas in order to raise the percentage of forest fires detections in area of particular importance, to monitor area with high fire weather index, and to monitor areas already affected by forest fires.

Furthermore, our project will calculate the probability of forest fires in certain areas, and will allow its integration in existing European CMIS.

Although initially implemented in our test bed in Macedonia and in our end-users Bulgarian Ministry of Interior and German Bundesministerium das Innern, our system will be open and available to all European countries.

This system will help all CMIS in Europe to develop and to implement different methodologies for initial stage warning, localization and organization of the firefighting teams and tactics to suppress the disaster.

Existed monitoring system of forest fires have the disadvantage of relatively low percentage of detecting of forest fires (between 23.5% – 30%). In our opinion, the main reason for this is that existing stationary systems cannot cover all areas of interest, especially in those where Fire Weather Index (FWI) is very high or the FWI is changing and Hot Spots may appear on different area.

The here proposed system based on mobile devises (drones) can solve this problem.

Title:	**„ASPires“ (Advanced Systems for Prevention and early detection of forest fires)**
Head:	M.Sc. Nikola Kletnikov
Type:	Research and development
Duration:	May 2017 – April 2019

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Budget (Macedonia):	164.141,00 €
Partners:	1. Hochschule Fulda University of Applied Sciences, Hesse, Germany 2. Military Academy "General Mihailo Apostolski" – Skopje, associate member of University "GoceDelchev"-Shtip 3. Comicon Ltd. Bulgaria, 4. InterConsult Bulgaria Ltd. 5. National Cluster for Intelligent Transport and Energy Systems (NCITES) in Sofia/Bulgaria representing 20 leading Bulgarian companies
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	Dr, Nevena Serafimova Assistant Professor, MA,UGD
	Nikola Manev young researcher MA,UGD

(English) Objectives

(English) Objectives

The general objective of the project is to develop advanced concepts of systems for early detection of forest fires that integrates sensor networks and mobile (drone) technologies for data collection, acquisition and analyses, which will be capable to improve the percentage of detecting of forest fires in areas of particular importance, to monitor areas with high and changing fire weather index, hot spots and areas already affected by forest fires, and to predict the behavior of forest fires. The system shares information and exchanges data between authorities, and at all levels of a national Crisis Management System. It improves the coordination mechanisms between local, regional and national authorities, enhanced partnerships between different public authorities and relevant stakeholders such as academia, research institutions, and the private sector, in particular for forest fires prevention in participating beneficiary's states and eligible third countries.
Furthermore, our system concepts for early detection of forest fires will support open interfaces to existing CMIS in beneficiaries and end-user countries, and make it available for all European states, and eligible third countries.

The specific objectives of the project are to:

- Develop and test of new modules and advance sensors for detecting and monitoring of forest area of particular importance and integrate modules in existing Forest Fires Information Systems, in particular MKFFIS in Macedonia as a test bed.
- Specify and experimental develop of a gateway between the sensor network and edge data network that will support interoperability, standard interfaces, and could be a basic point of heterogeneous network integration. Develop delay-tolerant network solutions and gossip protocols for hop-by-hop spreading of urgent sensor data (fire alarms).

- Categorize forest fires according to severity and by the degree of endangering forest areas of particular importance and other area with endemic speeches of threes.
- Provide specification for possible solutions for faster, constant and uninterrupted data flows between different agencies, services, institutions, sectors, and others integrated entities in Crisis Management System, which will significantly improve and support decision making process for fighting against the fires.
- Establish a mechanism for systematic collection of disaster related data by adopting international and European regulations (such as methodologies, guidelines, procedure for cooperation and coordination) to the target area by developing and implementing IT tools for collection, processing and dissemination of data.
- Improve substantially the use of disaster data for Crisis Management by sharing the best practices in cross-sector and cross-boundary risk management (in beneficiary's countries and other European countries).
- Develop of the integrated system architecture concepts, specification of functionality, standard interfaces and protocols, partial experimental analyses using sensors and mobile device (like a drone), and concept simulations in extreme environment.
- Develop of the scenarios of system testing, verification, validation at different levels.
- Research for cloud technology for processing of huge amount of data and possibility of the use of the cloud computing system and database.
    - Specify of cloud services and a way of possible integration to the existing solutions.

Final beneficiaries

Final beneficiaries

Coordinator of the Project

Hochschule Fulda University of Applied Sciences, Hesse, Germany https://www.hs-fulda.de

Fulda University of Applied Sciences is a practice-oriented university with an international profile. The special focus on applied research includes the independant right to confer the doctorate. Founded in 1974, the university encompasses, at present, eight departments with 55 study programmes, approx. 8,300 students and almost 1,100 international students from more than 100 countries, 170 professors, 125 academic and research staff, plus 250 administrative staff. The university offers a broad spectrum of academic and professional education with a special focus on "health, nutrition and food". Numerous research and development projects are undertaken in cooperation with private business and industry. Fulda University cooperates with ca. 100 universities around the world. The number of international programmes is growing continuously: "International Management", "Intercultural Communication and European Studies", "International Food Business and Consumer Studies", "Sustainable Food Systems", or "Global Software Development". These Master's programmes are partly or entirely taught in English. In October 2016 an international Bachelor's programme in "Science & Engineering" will start, the first two semesters taught in English, accompanying German classes.

Studing at Fulda University that means:

1. Right in the centre of Germany
2. No tuition fees: education is funded by the state
3. Practice-oriented education with a strong focus on applied research
4. State of the art laboratories
5. Strong links to business and industry: good job opportunities
6. Excellent support services for international students

Beneficiaries of this project are:

- Military Academy„General Mihailo Apostolski"

Skopje, Macedonia http://www.ma.edu.mk/?lang=en

Military Academy is military educational, scientific and research institution for university level education. It educates personnel for the Army of the Republic of Macedonia, system for crisis management and system for protection and rescue in the Republic of Macedonia. It is also open for education of foreign cadets/students according to the bilateral agreements.

Military Academy is in the organizational structure of the Ministry of Defense, and is associated member of the State University "Goce Delcev – Stip".

Military academy is founded by the Law and functions in accordance to the Law for High education and the Law for scientific-research work in Republic of Macedonia. It is accredited by the Ministry of education according to the European credit transfer system, as a high educational and scientific institution. It offers university studies in three cycles (the first cycle finishes by awarding a bachelor degree, the second cycle includes master studies and specializations, and the third cycle PhD).

The University diploma of completed undergraduate studies at the Military Academy is verified in the country, which provides cadets and students with relevant positions for further education within the educational system of Republic of Macedonia and other countries members of the Bologna's process.

1. Organization of the Military Academy is very similar to organizations of other military academies in NATO member countries. It is created in order to realize the model of education and training of officers in ARM given in the Concept for officer's core development in ARM. (According the new projections there will be 55 employees. No new employments are considered and the manning will be only with already employed Ministry of Defense and the Army of Republic of Macedonia.). For the realization of the Curriculum the faculty staff of the Military Academy includes:

Teachers who are employed at the Military Academy.

Professors from the Public Universities in the Republic of Macedonia.

Army officers from MoD and ARM.

Specialists for certain technical and military disciplines.

The teachers at the Military Academy are elected through an open competition in accordance with the Law on Higher Education in Republic of Macedonia.

2. The Military Academy Curricula are based on the needs of the defence forces, the national defence strategy, the latest developments in military education, and the models of military education used in several NATO-member countries. In the process for development of these curricula we use experiences and models of several NATO countries (USA, France, Slovakia, Italy, and Bulgaria).

The curriculum for undergraduate studies (I cycle of university study) and post graduate studies (II and III cycle of university study) is the core of the educational process at the Military academy.

3. The undergraduate studies curriculum (I cycle of university study) for the cadets (officer candidates in ARM) aims to achieve the following objectives:

to acquire fundamental knowledge of humanitarian, mathematical, natural, technical and military science;

to acquire wide general and technical culture and instruction for further schooling and self education;

to develop skills for using computers;

to develop good foreign language knowledge(English + one optional foreign language);

to develop high level of military knowledge at a tactical level;

to develop physical and mental readiness; and

to train to carry out the first command duties in ARM units.

Participation of different scientific fields in the structure of the undergraduate studies curriculum during the 8 semesters described in percentage is as follows:

Humanistic sciences and foreign languages – 37 %

Natural and Mathematical sciences – 8 %

Technical science (general -13,28% and military 9,76 %) – 13 %

Military sciences (general, military techniques and tactics) – 22 %

Practical Forms of Education (military training- A + physical training- A) – 20 %

Through the academic programme the cadets acquire fundamental professional knowledge in different scientific areas towards a degree for completed higher education.

The military and physical education programmes offer practical military knowledge, skills, habits, and physical readiness for future military duties.

The vocational orientation is acquired through optional subjects in year 3 and 4 and through special branch training.

Specialist training, such as military and physical training, is conducted during the winter months between the semesters and during the summer in all four years of study. This means that there are 20% from the total number ofteaching hours in all four years of study.

- Comicon Ltd. Bulgaria,

http://www.comicon.bg/component/option,com_frontpage/Itemid,1/lang,en/
COMICON has been established in 1991 as a private enterprise by specialists experienced in the field of industrial automation.

Main Activities

Main Activities

Turn-key solutions for automated control and monitoring of industrial processes and systems: design by certified designers, production of control panels, assembling, PLC, HMI & SCADA software, warranty and after sell service.

Production of ZigBee and EnOcean modules for wireless communication, interface converters (RS232, RS485, RS422, current loop), telemetric and embedded controllers, solar controllers, programmable logic controllers (PLC) and remote I/O, signal conditioners, transmitters, signal devices.

R&D of hardware, firmware and software for industrial automation based on specific customer specifications.

Implementation of Energy Management Systems.

Implementation of PLC, HMI and SCADA (Schneider Electric, Allen Bradley, Siemens, Vijeo Sitect, PME, OPC Systems .NET, 7T, Iconics, Kepware, Comicon), including SIL3.

Telemetric systems for wireless control and monitoring of remote installations.

Design, delivery and implementation of video wall systems for control rooms and other applications.

Supply of fire and gas detection products and systems for critical industrial applications.

COMICON is EN ISO 9001:2008 certified.

COMICON provides the following engineering services:
Key-turn solutions for automation of industrial processes and systems: design by certified designers, manufacture of control panels, installation, software for PLC, HMI & SCADA, commissioning, warranty and aftersale service.

Solutions for energy management and BMS.

Telemetric systems for remote wireless control and monitoring of installations.

Commissioning of PLC, HMI and SCADA (Schneider Electric, OAS, Allen Bradley, 7T, Siemens, Iconics, Kepware, Comicon), including SIL3.

Integration of industrial networks and equipment of different producers.

Construction & assembly works – parts Automation, Instrumentation and Electrical.

Design and building up of videowall systems for control rooms and other applications.

Please, see the "Reference list" with more detailed information about our realised projects.

COMICON has been honoured with award "Production with European quality" for its "System for wireless data acquisition from remote objects in non-electricity areas". The prize has been awarded by authoritative organization "Bulgarian Energy Forum".
The system for wireless data acquisition from remote objects in non-electricity areas provides an efficacious monitoring and control of remote installations of gas transition networks, water supply systems, petrol pipelines, high voltage electrical networks, pump stations, reservoirs, dams, etc.

- InterConsult Bulgaria Ltd.

http://www.icb.bg
FOR MORE THAN 20 YEARS ICB – INTERCONSULT BULGARIA HAS BEEN PROVIDING SOFTWARE DEVELOPMENT AND CONSULTANCY SERVICES TO MARKET-LEADERS IN SCANDINAVIA, WESTERN EUROPE, AND NORTH AMERICA.

Our company's client-centric and agile approach has helped us become one of the most successful companies in the Central and Eastern Europe (CEE) region. ICB has received the Information & Document Management Solution Provider for 2016 of the year award at IT Europa, the Innovation Hub of Bulgaria for 2013. ICB was recognized also as the Channel IT Company of 2010 at the prestigious IT Excellence award ceremony and has been awarded with the Seal of E-Excellence Award on the CeBIT Hanover Fair 2011. Find out more about our history and philosophy on the next pages.

RESEARCH & DEVELOPMENT

ICB's main ambition is to establish itself as an innovative research and development company, with a leading position in the development of the Bulgarian IT sector.
In the last years, we have established partnerships with top Bulgarian and international universities with which we are currently implementing joint projects. In 2008, we became a co-founder of the Business Process and Simulation Competence Centre SIMPRO, uniting the academia and business in the IT sector. SIMPRO is specialized in providing research, consultancy and trainings in business processes and simulations.
Our goal is through research to create local high-technology expertise, which is to disseminate to other Bulgarian IT SMEs in the form of trainings and publications. Thus we believe we can improve the overall competitiveness of the Bulgarian IT sector, in order to reduce the costs for implementation of big public platforms such as e-government and e-health.

We see our commitment to research and development as a way to develop both our innovation capacity and social responsibility.

ICB is interested in participating in various EU and national R&D projects. We are constantly expanding our networks by creating partnerships. If you are interested in collaborating with us on a R&D project, please do not hesitate to contact us.

SimPro Project

SimPro is a Centre of Excellence in Business Processes and Simulation. It is a partnership between the Faculty of Mathematics and Informatics at Sofia University (FMI) and InterConsult Bulgaria (ICB). SimPro has been established in 2009 with the support of the National Science Fund. Its purpose is to develop research, consultancy and training.

EU PROJECTS

Информация за сключен договор по ДБФП BG16RFOP002-2.001-1183: Подобряване на производствения капацитет в „Интерконсулт България" ООД"

На 3.11.2016 г. е сключен договор с предмет „Доставка на софтуерна платформа за автоматизиране и оптимизиране на производствени процеси" с ЦАПК ПРОГРЕС ГРУП АД по ДБФП BG16RFOP002-2.001-1183 „Подобряване на производствения капацитет в „Интерконсулт България" ООД"

Документация за участие в процедура „Избор с публична покана" с предмет „Доставка на софтуерна платформа за автоматизиране и оптимизиране на производствени процеси"" по ДБФП BG16RFOP002-2.001-1183 „Подобряване на производствения капацитет в „Интерконсулт България" ООД"

Стартира изпълнението на проект „Подобряване на производствения капацитет в „Интерконсулт България" ООД" по Оперативна програма „Иновации и конкурентоспособност" 2014-2020, финансиран чрез Европейски фонд за регионално развитие

„Интерконсулт България" ООД започна изпълнението на проект „Подобряване на производствения капацитет в „Интерконсулт България" ООД по Договор за безвъзмездна финансова помощ BG16RFOP002-2.001-1183-C01 по процедура „Подобряване на производствения капацитет в МПС, Приоритетна ос 2: Предприемачество и капацитет в растеж на МСП, Инвестиционен приоритет 2.2: Капацитет за растеж на МСП. Проектът се осъществява с финансовата подкрепа на Оперативна програма „Иновации и конкурентоспособност" 2014-2020, съфинансирана чрез Европейски фонд за регионално развитие.

Основните цели на проекта са:

- Повишаване на производствения капацитет чрез създаване на условия за автоматизиране и оптимизиране на производствените процеси;
- Засилване на експортния потенциал чрез повишаване качеството на произвежданите продукти и намаляване на тяхната себестойност.

Реализацията на проекта ще доведе до следните резултати:

- Подобрено качество на произвежданите продукти;
- Намаляване себестойността на продуктите;
- Минимизиране допускането на грешки;
- Откриване на възможно най-много дефекти и добиване на увереност в качеството на продукта и предоставяната информация за него;
- Намаляване на количеството изразходвана електроенергия;
- Оптимизиране на човешки ресурси и време;

- Гъвкава инфраструктура;
- Намаляване на количеството изразходвана хартия;
- Намаляване на електронни и други отпадъци.

Проект „Конкурентоспособност чрез внедряване на иновативни интегрирани решения в полза на бизнеса" по Оперативна програма „Развитие на конкурентоспособността на българската икономика" 2007-2013, финансиран чрез Европейски фонд за регионално развитие

Договор BG161PO003-1.1.07-0005-C0001

Успешно приключи проект „Конкурентоспособност чрез внедряване на иновативни интегрирани решения в полза на бизнеса" по Оперативна програма „Развитие на конкурентоспособността на българската икономика" 2007-2013, финансиран чрез Европейски фонд за регионално развитие по Договор BG161PO003-1.1.07-0005-C0001.

Основната цел на проекта е повишаване на конкурентоспособността на "Интерконсулт България" ООД чрез внедряване на иновативен интегриран софтуерен продукт.
Специфичните цели на проекта са:

- Максимизиране на ефективността от внедряване на нови иновативни решения в компанията;
- Постигане на положителен икономически ефект от прилагане на иновативния продукт;
- Разширяване на пазарните ниши на световния финансов пазар на „Интеконсулт България" ООД;
- Увеличаване на ИТ екипа на дружеството чрез разкриване на нови работни места.

За осъществяване на целите на проекта е внедрен иновативен софтуерен продукт чрез изцяло нова архитектура, създадена от „Интерконсулт България" ООД. Новата система представлява гъвкава, автоматизирана, модулна, стандартизирана и интегрируема система, която осигурява бързо и лесно внедряване на процеси. Раздробяването на отделни модули дава възможност за лесното им комбиниране и осигурява тяхната независимост, а стандартизацията позволява интегрирането им с други съществуващи системи.

Проект „Технологична модернизация" в „Интерконсулт България" ООД по Оперативна програма „Развитие на конкурентоспособността на българската икономика" 2007-2013, финансиран чрез Европейски фонд за регионално развитие

Договор BG161PO003-2.1.13-0205-0001

Успешно приключи проект „Технологична модернизация в „Интерконсулт България" ООД по Оперативна програма „Развитие на конкурентоспособността на българската икономика" 2007-2013, финансиран чрез Европейски фонд за регионално развитие по Договор BG161PO003-2.1.13-0205-0001.

Общата цел на проекта е повишаване на конкурентоспособността на Интерконсулт България ООД чрез инвестиции в съвременни технологии и оборудване.

Специфичните цели са увеличаване на технологичния капацитет на предоставяне на услугите и подобряване на качеството на предоставяните услуги.

За осъществяване на целите на проекта са закупени, доставени, монтирани/инсталирани и пуснати в експлоатация следното оборудване и софтуерни продукти и лицензи:

- Блейд сървъри
- Дискова подсистема
- Мрежови комутатори
- Точки за достъп
- Мрежови контролер
- Генератор
- Софтуер за моделиране и управление на бизнес процеси
- Операционни системи за сървърите за изграждане на виртуална десктоп инфраструктура
- Лицензи за достъп до виртуални десктоп машини

- National Cluster for Intelligent Transport and Energy Systems (NCITES) in Sofia/Bulgaria representing 20 leading Bulgarian companies http://www.cluster-ites.org/en

National Cluster for Intelligent Transport and Energy Systems (NCITES) is a voluntary association of companies and individuals.

Tasks and activities

- The aim is to achieve a more efficient concentration of resources to improve competitiveness and expand the range of resources of each individual participant.
- To develop scientific and practical projects in the field of Intelligent Control Systems.

The Association aims to participate actively in the production and implementation of national and European standards related to the management systems of intelligent transport and energy systems.

NCITES is organized on a technological, market and geographic basis. It covers mainly companies in telecommunications, information technology, transport and energy technical infrastructure.

NCITES cooperates closely with research, training and engineering organizations, as well as with organizations representing business; it develops and implement innovative solutions that domineer in European infrastructure.

End users of this project would be:

- Ministry of environment and physical planning http://www.moepp.gov.mk/?lang=en

- Ministry of Agriculture, Forestry and Water Economy http://www.m 2 sv.g 0 v.mk/
- Crisis Management Center, Skopje, Macedonia, http://www.cuk.gov.mk/index.php?option=com content&view=featured&ltemid=l27&lang=en
- National park Mavrovo http://npmavrovo.org.mk/en/;
- National park Pelister http://park-pelister.com/en/:
- Bulgarian National emergency management authority: Fire Safety and Civil Protection Chief Directorate, Ministry of Interior
- German Bundesministerium des Innern

Expected Results

Expected Results

We will develop, experimentally implement, and test an integrated advanced system for early detection and monitoring of forest fires that integrates sensor networks and mobile (drone) technologies for data collection and acquisition at existing crisis management information systems (CMIS).

This system will help for further development and the implementation of different methodologies for initial stage warning, localization and organization of the firefighting teams and tactics to suppress the disaster and will have the described below impacts.

Expected results of the project short term impact

1. Sharing and exchange of data for forest fires between the different levels of prevention, preparedness and rescue agencies, services, and institutions.
2. Proper standards for communication with the goal of overcoming the challenges of dependence of the information systems on known and already used technology described, and an information system created and implemented, as a whole, based on structure-oriented architecture.
3. Cost reduction of real-time approach for forest fires detection and monitoring in national parks. Automatic processing of information for forest fires establishment and optionally system alert generation.
4. Forest fires categorized according to severity and by the degree of endangering forest areas of particular importance and other area with endemic speeches of threes.
5. Drone solution and gateway experiments.
    I. Delay-tolerant network solutions and gossip protocols for hop-by-hop spreading of urgent sensor data (fire alarms) developed.
6. Main actors and systems and their possible level of integration to the integrated solution of the project specification.
7. Simulation of predicting of forest fires behavior network. End-to-end testing, verification and validation.
8. Developed solution will be implemented with the existing tower infrastructure.
9. Detection of forest fire is increased and significantly reduce of the false alarms.
10. Possibility of management in command various types of barriers, tourniquets, locks and locking mechanisms in the protected or surround area.
11. Object tracking option of a fire or intruder.
12. Safety standards for communication, controlling access, sharing and dissemination of the data in use.
13. Coordination and cooperation of services included in the prevention, preparedness and rescue process improved.
14. Achieved results implemented in framework of law.

15. Data sharing to Data centers in all across Europe and Non El) countries.
16. Developed software and hardware solutions in different parts of the network are validated.
17. View how and what to integrate at national and international/ European level.
18. Protection of people and properties from forest fires improved and negatives impacts of climate changes reduction.
19. Assessment of forest fires is improved. Manpower and technical equipment and management that answer to crisis situations is more appropriate and faster. Functions of CM are improved.
20. Capacities for detection of forest fires and monitoring of forest areas of particular importance which are rich with endemic specimens of flora and fauna in real time are developed and damages caused by forest fires in forest areas of particular importance are significantly reduced.
21. Received serial data from measurements are in use for improving experiences in detection and monitoring of forest fires and opened for added values.
    I. All products will be ready for integration on European level and with heterogeneous systems.

Expected results of the project medium term impact
Expected results of the project long-term impact

Added value of the results of this project would be the more appropriate method of monitoring the forest areas of particular importance (such as national parks and other area with endemic speeches of flora and fauna). Development, test and integration of advanced systems for prevention and early detection of forest fires can serve as a model for monitoring of the forest areas of particular importance in other countries/governments and national parks in Europe. Also, other public bodies in Europe responsible for Crisis Management can learn from the project. The developed system will be scalable and component-based and will allow easy integration on many existing systems using standardized interfaces. In this sense, the added value of the project is proof of concepts at European level.

Implementation of this project will increase the need for production of mobile equipment for detecting of forest fires and monitoring of forest area of particular importance and improvement of information systems used for detecting of forest fires. During last years, intensive research has been done in area of improvement of sensitivity of sensors for detecting of forest fires and improving percentage of detected forest fires using stationary equipment.

Contact

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