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END-USER ORIENTED RESEARCH: ABOUT THE BENEFITS FOR LOCAL SAFETY AND SECURITY

Badania zorientowanne na użytkownika końcowego: korzyści dla bezpieczeństwa i ochrony społeczności lokalnej

Summary
Research activities within the field of civil safety and security are comparatively new tasks for German fire brigades and disaster management authorities. For a long time, the field has been dominated by military demands and aimed strongly towards military results. The changes in the global safety situation have over the last decade brought a significant increase in financial support for civil research activities, e. g. within the 7th European Framework Programme or several national programmes. Most of these programmes require the co-operation of research institutions, industrial partners and end-users. In Germany, fire brigades are organised on a municipal level. The municipalities are responsible for fire prevention and suppression, counties and county boroughs are responsible for disaster management. There is no centralised fire brigade on the level of the states (*Länder*) or even the national level: The *Länder* are responsible for the legal framework and certain central support measures such as officer's training. The national level plays a role in civil protection only in case of tension or defence. Therefore, no central research institutions for fire and rescue tasks exist on these levels, and the legal framework does not address the necessity of research on the municipal level. Nevertheless, several German fire brigades show own activities and participate in various programmes. The presentation will discuss which positive effects these activities have on the fire brigades. Also, it will deal with the questions how the strongly decentralised structures of the fire brigades can despite be used to obtain a common picture of the demands the end-users have regarding topics to be addressed: Only showing activities in the area of research today will enable the end-users to have a strong impact on the development of the technology which will be in use ten years from now.

Streszczenie
Działania badawcze w zakresie bezpieczeństwa cywilnego i bezpieczeństwa są stosunkowo nowym zadaniem dla niemieckiej straży pożarnej i służb zarządzania kryzysowego. Od dłuższego czasu, ten obszar był zdominowany przez potrzeby wojska i silnie skierowany ku wojskowym wynikom. Zmiany w sytuacji globalnego bezpieczeństwa, w ciągu ostatniej dekady, przyniosły znaczny wzrost wsparcia finansowego dla cywilnych działań badawczych, np. w ramach 7. Europejskiego Programu Ramowego lub poszczególnych programów krajowych. Większość z tych programów wymaga współpracy instytucji badawczych, partnerów przemysłowych i użytkowników końcowych. W Niemczech straż pożarna jest zorganizowana na poziomie gmin. Gminy są odpowiedzialne za zapobieganie i gaszenie pożarów, a powiaty i gminy powiatowe są odpowiedzialne za zarządzanie kryzysowe.
Nie ma scentralizowanej straży pożarnej na szczeblu krajów związkowych (*Länder*) lub nawet na poziomie krajowym: Kraje Związkowe (*Länder*) są odpowiedzialne za ramy prawne oraz niektóre główne środki wsparcia, takie jak szkolenie oficerów. Krajowy poziom odgrywa ważną rolę w zakresie ochrony ludności tylko w sytuacjach napięć lub obrony. Dlatego też niescentralizowane instytuty badawcze pracujące dla dziedziny ochrony przeciwpożarowej i ratownictwa istnieją właśnie na na tym poziomie podziału administracyjnego, a prawne ramy nie są ograniczone koniecznością badania na poziomie gminy.
Jednak wiele niemieckich jednostek organizacyjnych straży pożarnej wykazuje się dużą aktywnością i uczestniczy w różnych programach. Niniejszy artykuł omówi, jakie pozytywne efekty dla straży pożarnej mają tego rodzaju działania. Postara się także omówić jak silnie zdecentralizowane struktury straży pożarnej obrazują wspólne potrzeby użytkowników końcowych. Ich aktywność na polu badań pozwoli im mieć duży wpływ na rozwój technologii, która będzie stosowana w ciągu następnych 10 lat.

Słowa kluczowe: straż pożarna, ochrona przeciwpożarowa, użytkownik końcowy, badania, Republika Federalna Niemiec;
Keywords: fire service, fire protection, end-user, research, Federal Republic of Germany;

Research activities in the field of civil safety and security are comparatively new tasks for German fire brigades and disaster management authorities. For a long time, the field has been dominated by military demands and strongly aimed towards military results and solutions. The actors in this field traditionally have in the past received quite intense financial grants. Civil applications often have been modifications or spin-offs of military technologies. Nevertheless, the changes to this research field have been significant in the last decades. The change of the global safety situation have brought a significant increase in financial support for civil safety and security research activities, e. g. within the 7th European Framework Programme or several national programmes such as the programme "Research for Civil Security" funded by the German Federal Government. In future, the support for civil safety and security research still will increase. With "Horizon 2020", the European Commission has launched another large-scale funding programme which will enable a cross-border and multi-disciplinary research over several years. But research shall not be done for its own purpose, but has to be based on the needs and demands of the end-users. Therefore, most of these programmes mandatorily require the co-operation of (university or non-university) research institutions with both industrial partners and end-users. Besides, it is stated that scenario-driven research approaches will be supported stronger. However, this ideal state of co-operation is in Germany not reached until today in safety and security research. While research institutions and industrial partners are used to the methods and procedures of research funding, most organisations participating in the systems of disaster management still have to adapt to the system of calls, tenders and grants. Taking a closer look at the structure of disaster management in general and fire brigades in special, the reason for this can be understood better.

Structure of Fire Brigades and Disaster management in Germany

After World War 2, Germany was designed and rebuilt as a federal republic, so the political and administrative systems show a strongly decentralised structure. Additionally, there is a clear separation between police and non-police tasks and their operations. The consequence is a comparatively complex system of roles and responsibility also in the area of disaster management which is based on the principles of federalism and subsidiarity. The Fire Brigades are organised on a municipal level. The municipalities are by law responsible for both fire prevention and suppression; counties and county boroughs are responsible for establishing a disaster management system and obtaining an emergency medical service. Even in case of large-scale incidents, incident command will therefore always remain on the level of a county or county borough. There is no centralised fire brigade on the level of the 16 German states (*Länder*) or even at the national level: The states are responsible for setting up the legal framework and certain central support measures such as high-level co-ordination in case of incidents, officer's training or financial / technical support for highly specialised forces. In consequence, this leads to 16 different fire service and disaster management laws. The national level plays a role in civil protection only in case of tension or defence, supports certain high-level trainings and gives financial / technical support to the states. Therefore, there is no central research institution for fire and rescue tasks on the national level in Germany, and the legal framework of the states also does not address the necessity of safety and security research on the municipal level.

„Solution looking for a problem … ?"

Despite the problems pointed out above, only showing today activities in the area of research will enable the fire brigades to give a strong impact on the development of the technology which will be in future use several years from now. Several German fire brigades therefore do show own research activities and participate in various programmes. Innovations can be successful when they will find acceptance among the end-users. Thus, it is on the one hand consequent to participate in research programmes. But since Fire Brigades are municipally organized, there are many brigades, but all of a relatively small size compared to organisations of the states or national agencies or institutions. Thus, it is difficult to be steadily active in the field of research. Additionally, the tense financial situation in the majority of German municipalities often is a reason for not participating in research projects. Obviously, one is then in danger of lose track to the state of art of technical developments. Besides, the present funding instruments will in any way be used by those being able to establish cooperation consortia and produce tenders to research calls. Obtaining a more or less passive role, Fire Brigades often are taken into a consortium in a relatively late stage when they will not be able to influence the contents of the cooperation. As a result, it can frequently be observed that new technical solutions are developed which in the end do not meet and have never met the needs of the end-users or do not correspond to the structures of disaster management.

Benefit of a common approach

One way to overcome the obstacles mentioned above is to cooperate. In the state of North-Rhine Westphalia (NRW), the Federation of Professional Fire Brigades Chiefs *(Arbeitsgemeinschaft der Leiter der Berufsfeuerwehren* – AGBF) for this purpose has established a permanent working group "Research" in which Fire Brigades with an interest in safety and security research topics can exchange their experiences. A position paper showing the research needs and demands of the end-users

has currently been developed as one of the first results of the working group. This paper shall help potential industrial or scientific partners to recognize the needs of the Fire Brigades already in a very early concept stage of a consortium. Furthermore, the working group carries out information events to inform potential partners about the structure of Fire Brigades and their research needs and demands. Additionally, the German Fire Protection Association (GFPA, *Vereinigung zur Förderung des Deutschen Brandschutzes e. V.* – vfdb) is an important national and international platform to establish contacts between fire brigades and industry or universities. Last not least the German Fire Brigades Association *(Deutscher Feuerwehrverband* – DFV) has recognized the importance of research for fire brigades and has placed this topic as a key assignment within its steering committee.

Federalism can work well

All efforts to cooperate shall not aim towards centralised structures in which research work is structured with regards to contents or distributed to certain fire brigades. This would on the one hand not fit to the decentralised structures of the German fire brigades. On the other hand, it would be a contradiction to the character of science itself where progress always is achieved in a healthy competition of various institutions. We have to concentrate on defining our research needs and demands on a broad and common basis and influencing the future funding programmes with regards to both content and general conditions.

Institute for Fire Service and Rescue Technology (IFR)

The City of Dortmund Fire Brigade (FDDO) is active within the field of research for more than ten years now and has, so to say, carried out safety and security research even before this term has been invented. With a staff of approx. 750 professional and 850 voluntary members, FDDO is the 6th largest fire brigade in Germany and provides safety for about 600.000 inhabitants of Dortmund. IFR has been established as a research institute within the fire brigade in 2006 and currently focuses its research on information and communication technology, mechatronical and robotical systems as well as on decision support instruments. Starting with end-user expertise in several single projects, IFR now looks back on 16 national and international projects and has developed a structure which combines both scientific work and end-user expertise. Scientists, some of them with a background in fire-fighting, closely work together with fire fighters or officers with a broad all-day operational expertise. Since IFR also has an appropriate administrative background, the institute is also able to handle co-ordination tasks such as the leadership of a consortium or the management of the permanent working group "Research" of AGBF NRW.

Some project examples: AirShield, NIFTi and ANCHORS

IFR has been involved in the national project AirShield[1] and is involved as full partner in the EU project NIFTi[2] (Natural Homan-Robot Co-operation in Dynamic Environment) and acts as full partner and co-ordinator of the German consortium in the French-German cooperation ANCHORS[3] (Ad-hoc Network for Crisis Management and Hostile Environment Sensing).

Fig. 1. AirShield: Quadrocopter as part of the AirShield Swarm during the practical demonstration

The focus of NIFTi lies on a simplified and intuitive interaction between humans and robots, for which both unmanned ground (UGV) and aerial vehicles (UAV) are used.

AirShield aimed towards designing an autonomous swarm of several UAV which can be used for measurements of hazardous substances. The command and control task for a human operator should be limited to an absolutely necessary minimum, so that the swarm can perform several operations (measuring path, area coverage, holding position and distance) on its own. IFR has been active in defining use-cases and scenarios and has performed several practical test operations in field. The AirShield project has been completed with the end of 2011 and has demonstrated the feasibility of the concept in various exercises. FDDO will keep two quadrocopters from the AirShield project and currently is working on bringing them from the demonstration phase into an operational use for all-day emergency operations with a 24/7 availability.

Fig. 2. ANCHORS (left) and NIFTi (right): Unmanned ground and aerial vehicles in combined operations

[1] http://www.airshield.de/
[2] http://www.nifti.eu/
[3] http://www.anchors-project.org/

ANCHORS aims at larger-scale scenarios and will combine the operations of UAV swarms with UGV operations. The basic idea is to let UAV enter large-scale contaminated areas on a carrier (anchor) platform which will transport the UGV swarm as close as possible to the incident scene where the UAV will then be released to perform their operation. During the operation, the UGVs will return to their anchor platform to have their batteries automatically recharged. Since the flight time of UAVs is limited to a maximum of 30 minutes depending on the load they carry, response and return times can be minimized and operational air time is kept high. It will be able to access and assess highly dangerous scenes by using the ANCHORS system without bringing personnel into dangerous situations. Even though the project still is in the research phase, FDDO will also draw a direct profit since parts from the system will remain with FDDO in operation. Besides, being active as coordinator already in very early stages of the project definition has made it possible to give the right impact to the project in order to meet the demands and structures of disaster management. This increases the probability that the system one day finds its way into real operations.

Benefit beyond Disaster Management

Being active in the field of security research can also have impacts beyond the plain development of new technologies for operations. By cooperating in research consortia, further business partners draw a profit from these works either because they can be integrated into the works or because the may act as further suppliers of technology. This can, depending on the structure of the consortia, have an impact on a region as well and may for a city lead to a locational advantage – not only due to an increased operational capability of the Fire Brigade, but also due to scientific reputation in case a scientific cluster will develop.

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W 2003 r. uzyskał stopień doktora inżyniera na tym samym Uniwersytecie. Od 1994 r. związany ze strażą pożarną, początkowo z jej strukturami ochotniczymi. Był koordynatorem wielu projektów realizowanych w dziedzinie bezpieczeństwa. Obecnie, od 2011 r. pracuje na stanowisku dyrektora Institute for Fire and Rescue Technology w Dortmundzie.