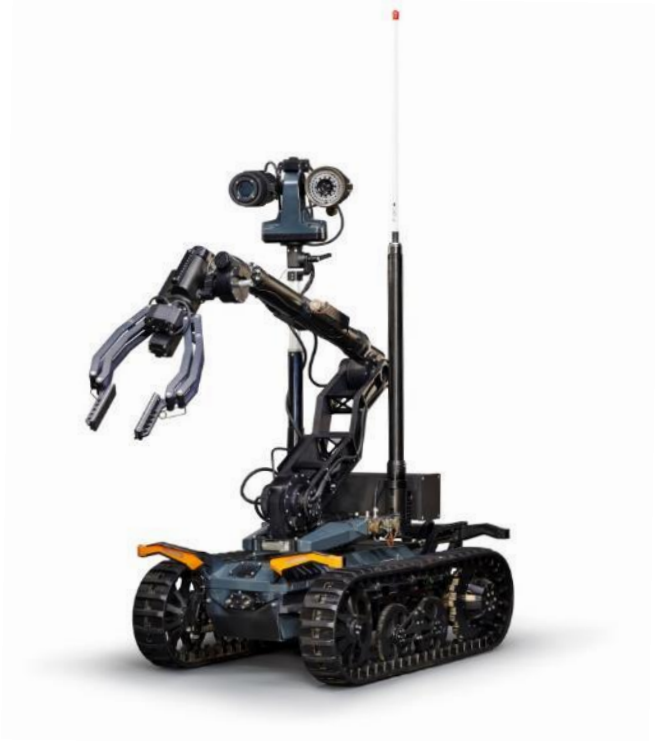
UNMANNED GROUND VEHICLES IN SPECIAL OPERATIONS



INDUSTRIAL RESEARCH INSTITUTE FOR AUTOMATION AND MEASUREMENTS PIAP

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Security and Defence meeting, Brussles 22/11/2017

About Us

- In the top ten of Polish Research Institutes
- Supervised by Ministry of Development
- The first and biggest producer of high quality mobile robots for special operations in Poland.

Producer & researcher:
- Mobile robots for security & defence
- Automatisation & robotisation of production and assembly lines
- Special equipment for police, army and civil protection services
- Research for industry

Other activities:
- AUTOMATICON / AUTOMATION – annual tradeshow & science conference
- Editor of journals: AUTOMATYKA (B2B), PAR (for engineers and scientists) and JAMRIS (research journal)
- Industry trainings
- Workshops, seminars, shows, education events and many other

Awarded in Poland, Europe and worldwide for the technical expertise within the field of robotics.

International projects

Since 1991
1st EU founded project in FP3

ca.100
projects
10% as coordinator

International
EU Framework Programmes, EDA, ESA, H2020

Security projects

- **TALOS** - Transportable Autonomous patrol for Land bOrder Surveillance system (SEC-2007-3.2-02)
- **MICIE** - Tool for systemic risk analysis and secure mediation of data exchanged across linked CI information (ICT-SEC-2007.1.7)
- **HEMOLIA** - Hybrid Enhanced Anti Money Laundering Intelligence, Investigation, Incrimination and Alerts (SEC-2010.1.3-1)
- **FORLAB** - FORensic LABoratory for in-situ evidence analysis in a post blast scenario (SEC-2011.1.3-2)
- **ARCHIMEDES** - Support to security end users (SEC-2011-7.5-1)
- **EDEN** - End-user driven DEmo for cbrNe (SEC-2012.1.5-1)
- **AEROCEPTOR** - UAV Based Innovative Means For Land And Sea Non-cooperative Vehicles Stop (SEC-2011.1.4-2)

Other themes

- **R5COP** - Reconfigurable ROS-based Resilient Reasoning Robotic Cooperating Systems (ARTEMIS-2013-1-621447)
- **STIFF-FLOP** - STIFFness controllable Flexible and Learn-able Manipulator for surgical Operations (FP7-ICT-2011-2.1)
- **SAFETRIP** - Satellite application for emergency handling, traffic alerts, road safety and incident prevention (FP7-SST-2008-4.1.3)

EU FP7 Security Projects – coordination

TALOS - Transportable Autonomous Patrol for Land Border Surveillance System

(SEC-2007-3.2-02)

- Budget – 20 mln Euro
- EC contribution – 13 mln Euro
- Duration: 2008 – 2012
- Objective – develop and field test the innovative concept of a mobile, modular, scalable, autonomous and adaptive system for borders protection
- Result – technology demonstrator

Commercialisation of research results

EDEN - End-user driven DEmo for cbrNe
(FP7-SEC-2012.1.5-1)

Providing CBRNE resilience for society requiring a multi-facetted system-of-systems approach, covering most of the identified hazards and their effects across the whole CBRNE security spectrum including threat assessment, prevention, preparedness, detection, response and recovery.

CBRNE Accessories
(examples)

- PIAP Bio-Vortex - biofouling sampling device
- Modular probe for liquids - collection and storage of liquid samples
- C-Sensor - spectrometer for industrial toxic detection

H2020 projects - ongoing

ENCIRCLE - European Cbrn Innovation for the maRket Cluster
(H2020-SEC-05-DRS-2016-2017)

The project is aimed at prompting the innovation and business development, and filling market gaps in the project timeframe by: creating an open and neutral EU CBRN cluster, providing a vision and roadmap for the development of the European CBRN market and innovations.

CAMELOT - C2 Advanced Multi-domain Environment and Live Observation Technologies
(H2020-SEC-20-BES-2016)

The project proposes to develop and demonstrate different advanced command and control service modules for multiple platform domains, allowing the development of a modular and scalable command and control station, customisable to the user needs.

ALLADIN - Advanced hoListic Adverse Drone Detection, Identification Neutralization
(H2020-SEC-12-FCT-2016-2017)

The project will study, design, develop, and evaluate, in series of complementary pilots, a counter UAV system as a complete solution to the growing UAV threat problem.

I3DS - Integrated 3D Sensors suite
(H2020-COMPET-4-2016-SRC)

The I3DS platform is a generic and modular system answering the needs of near-future space exploration missions in terms of exteroceptive and proprioceptive sensors with integrated pre-processing and data concentration functions.

EDA projects

ERA – Enhanced RPAS Automation
(A-1426-GP-RPAS)

Supporting the use of civil and military RPAS in nonsegregated airspace in Europe by ddressing capability gaps identified in the European RPAS Steering Group (ERSG) Roadmap and contributing to setting the European standards for the certification of the Automatic Takeoff and Landing, Autotaxi and Automation and Emergency Recovery functionalities.

MUSICODE – UGV stand-off multi-sensor platform for IED component detection
(B 1465 GEM3 GP)

Designing and developing a TRL 5 Technology Demonstrator of a UGV equipped with a variety of sensors for detection of IED components in support of Route Clearance Operations.

SABUVIS – Swarm of Biomimetic Underwater Vehicles for Underwater ISR
(B-1452-ESM1-GP)

Building heterogeneous BUVs with indulating propulsion able to operate in autonomous (or semi-autonomous mode) and communicating with each other for selected scenarios of underwater ISR.

UGS-LIS - Unmanned Ground Systems Landscaping and Integration Study
(13.CAP.OP.592)

Study on technological, operational, legal, ethical and moral implications of using Unmanned Ground Systems (UGS) in military operations with a focus on autonomy provided by artificial intelligence.

UGTV – Unmanned Ground Tactical Vehicle
(B-0068-GEM3-GC)

Preliminary study on potentialities of a system for automatic control of a ground vehicle, based on a production platform, providing a comprehensive analysis of performances, risks and benefits; demonstrating a modular system architecture and exploiting technologies that are already in use at commercial or prototype level in modern defence systems.

MUSAS - Multi Sensor Anti Sniper System
(A-0380-RT-GC)

Research studies in acoustic and radar sensors as well as image processing and feasibility study of an enhanced sniper detection system with data fusion (including intelligence information, human machine interface) to obtain a real-time reliable estimation of the sniper detection before and after the first shot, optimising the resources for neutralisation.

Products – mobile robots for special use

MPI
(1200 kg)

INSPECTOR®
(550 kg)

PIAP IBIS®
(280 kg)

EXPERT®
(180 kg)

PIAP RMI®
(60kg)

PIAP GRYF®
(38 kg)

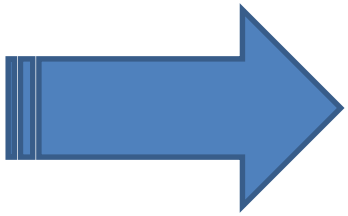
PIAP FENIX®
(19 kg)

PIAP SCOUT®
(15 kg)

TRM® 2.0
(1,4 kg)

UGV – Main purpose and special use examples

Goal of the robotics in security & defence is to **push humans away from threats**.

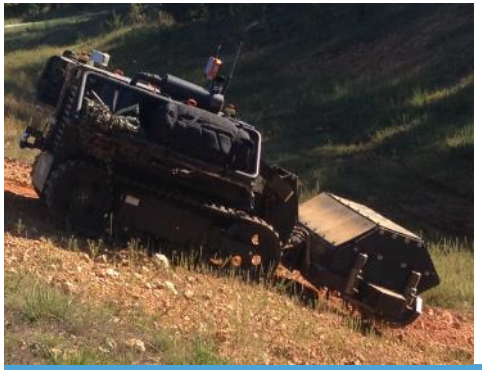


UGV – special use examples

1. Demining

MV-4 (Croatia) after armor-piercing bomb explosion

Bożena (Slovakia)

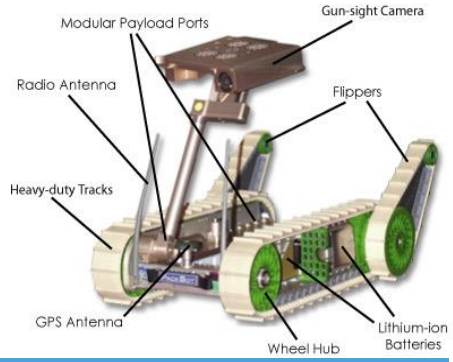


ACER (MESA Robotics, USA) – version for anti-personnel mine

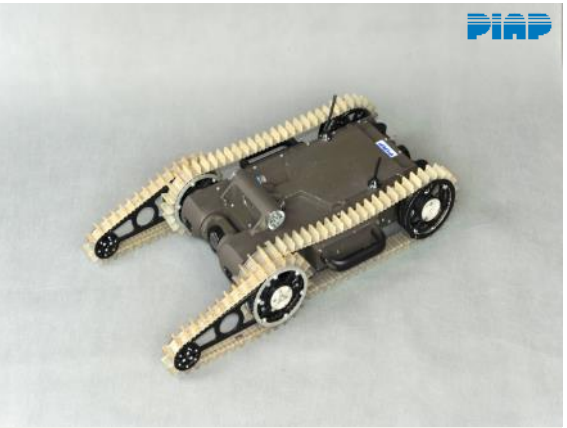
UGV – special use examples

2. Reconnaissance – small robots

Dragon Runner (CMU, USA)



Packbot (iRobot, USA)



PIAP Scout (Poland)

UGV – special use examples

3. Guarding and patrolling tasks

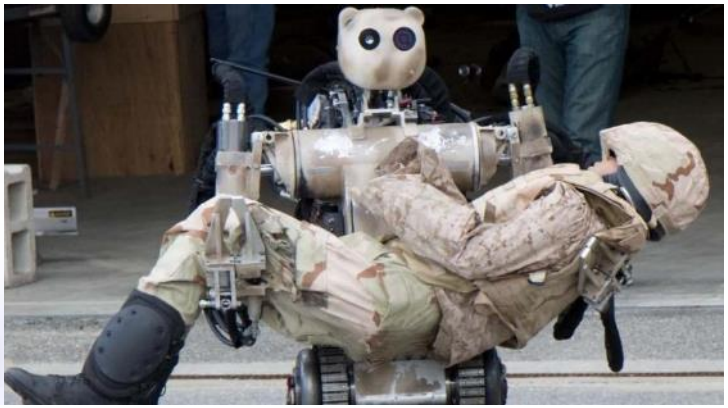
Intelligent Surveillance and Guard Robot, South Korea

Mobile Detection Assesment Response System MDARS, USA

UGV – special use examples

4. Evacuation of wounded people from the threat area

BEAR (Vecna Robotics, USA)



Mobile INSPECTOR (PIAP, Poland)

UGV – special use examples

5. Fighting fires

6. CBRN operations

7. Inspection

UGV – special use examples

8. Explosive Ordnance Disposal (EOD) & Improvised Explosive Device (IED) Disposal

UGV – special use examples

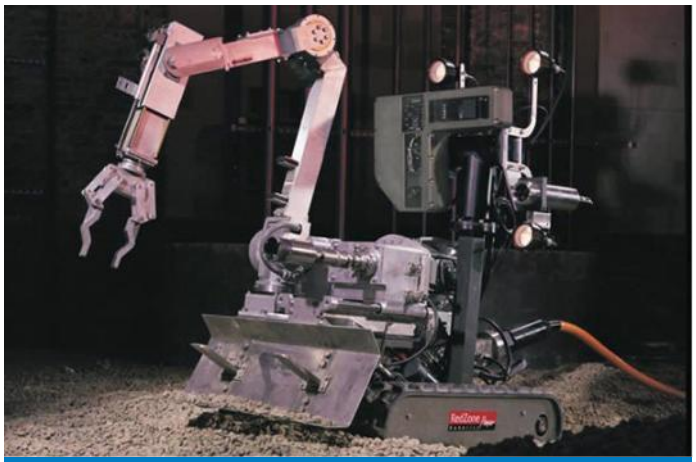
9. Military engineering and logistics

Engineering and logistic UGVs designed in Military University of Technology in Warsaw

UGV – special use examples

10. Accidents in nuclear powerplants

- ✓ Supervision of radioactive waste disposal
- ✓ Supervision of strategic part of the reactor (e.g. tubes & shields)
- ✓ Transportation of large objects
- ✓ Manipulation of small, radioactive objects
- ✓ Assembly of small fragments of installations
- ✓ Routine repairs in a hazardous environment
- ✓ Repairs during small accidents
- ✓ Assessment of the effects of a major accident
- ✓ Cleaning



Chernobyl, 1999 Pioneer Robot

TMI accident, 1983 robot RRR

UGV – special use examples

11. Search for victims of earthquakes and construction disasters

UGV – New Challenge: Weaponized UGVs

- Weaponized UGVs are under intensive development in several countries.
- Especially high level of activities can be observed in Russia.
- Weaponized UGVs were used during military trainings and even during real operations in Syria.

Platform M

RBTK amfibia

Uran - 9

ZID (Nierichta)

Recommendations

1) **UGVs for EU**

The need for military UGVs shall be addressed in research and high TRL levels projects.

Those projects could lead to

FUTURE EUROPEAN UNMANNED GROUND VEHICLE PLATFORMS

build within European consortium.

2) **EDIDP implementation shall be balanced**

- according to sizes of research and industrial entities,
- geographically.

Probably „Polish Industry Incentive Scheme" model used in case of Poland joining ESA can be a good inspiration. It can help to avoid domination of big defence industry corporations. It consists of: guaranteed 80% geographical financial return, dedicated grants, know-how and trainings support, expert committee for monitoring. It is 5 years programme for Polish industry to give it a chance to become competitive on EU space market.

THANK YOU!


PIAP®
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