

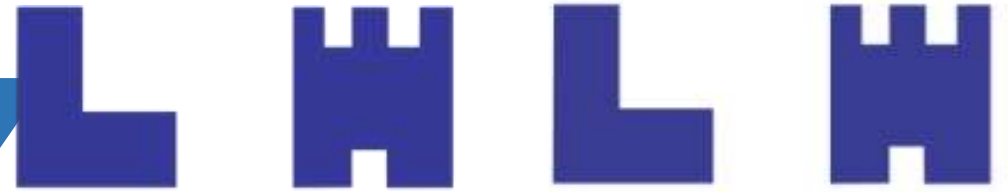
Faculty of Transport and Mechanical Engineering

Department of Automobile and Transport Technology

Department of Industrial Machinery Engineering

Department of Applied Mechanics and Mechatronics

Department of Physics and
Higher Mathematics





INTELLIGENT INFORMATION SYSTEM (IIS) FOR RESOURCE PLANNING IN GRAIN CROPS DELIVERY PROJECTS

The IIS utilizes a developed algorithm for resource planning in grain crops delivery projects are based on the random forest machine learning model

Results of Implementation of IIS:

- The reduction in total fuel consumption by vehicles ranges from 2.9 to 9.9% daily, with an average of 6.55%.
- Fuel consumption is saved in the amount of 62 liters per month.
- The time for making a management decision is reduced by 1.43 minutes or 95.6%.
- The costs of the motor transport enterprise are reduced by UAH 333.6K and 6.3%.

The choice of rational means of transport
Mon Aug 21 21:48:42 2023

Cars are available

Car #	Model	Availability	Count
Car #1	DAF_FT_CF_85_410	Availability of cars #1, units	4
Car #2	DAF_XF_105_460	Availability of cars #2, units	2
Car #3	DAF_XP95_480	Availability of cars #3, units	3
Car #4	DAF_CFB5_430	Availability of cars #4, units	2
Car #5	MAJ_543205_020	Availability of cars #5, units	1

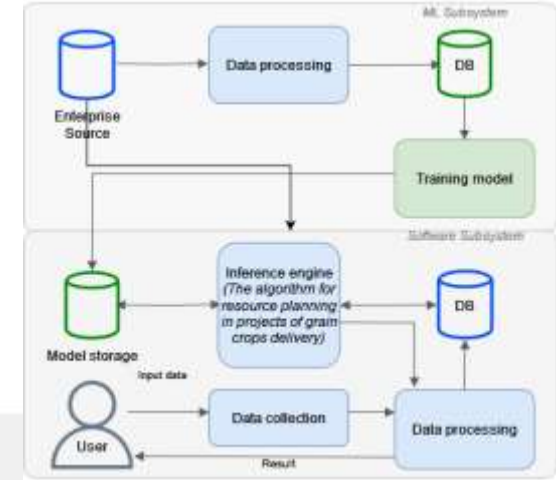
Order for transportation of seeds of grain crops

Agricultural enterprise No.	Distance, km	Cargo volume, tons	Type of cargo	Priority
Agricultural enterprise No. 1	18	20	Пшеница	1
Agricultural enterprise No. 2	65	21	Пшеница	1
Agricultural enterprise No. 3	50	18	Рис	2
Agricultural enterprise No. 4	38	22	Жито	2
Agricultural enterprise No. 5	22	21	Пшеница	1

Buttons: CARS INFORMATION, CALCULATE, RESET, EXIT

Results of the choice of rational means of transport

Car #	Distance, km	Cargo volume, tons	Type of cargo	Priority
Car #1	18	20	Пшеница	1
Car #2	65	21	Пшеница	1
Car #3	50	18	Рис	2
Car #4	38	22	Жито	2
Car #5	22	21	Пшеница	1



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ADVANCED METALLIC WASTE PROCESSING

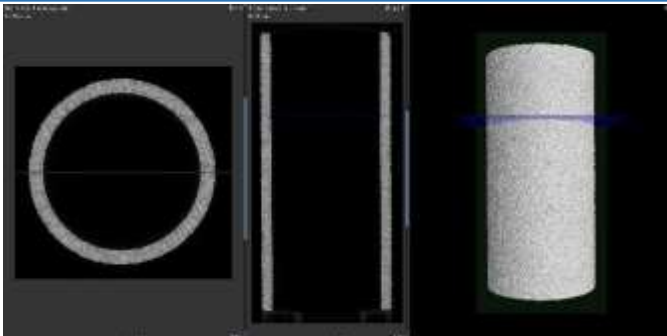
- ❑ Processing and compacting of industrial metal containing sludge
- ❑ Turning waste machining chips into quality products
- ❑ Design and fabrication of liquid/air filters made of metallic/ceramic powder
- ❑ Compaction of axio-symmetric products with isostatic pressing
- ❑ Post sintering
- ❑ Numerical modelling and design of ceramic/metallic filters



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USE OF BIOMEDICAL PRODUCTION WASTE TO OBTAIN HIGHLY EFFICIENT FILTERS



ROBOT-AVATAR

**Test model of
manipulator**



**Special glove
(controller)
for an arm**



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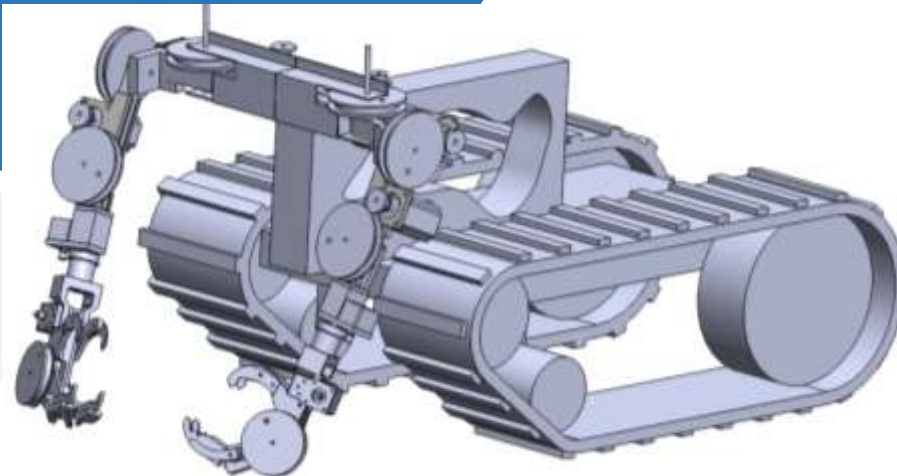
It is a remote-controlled robotic device that very precisely replicates the movements of a human arm and is intended for safe distance demining

Remote control may be performed without computer

Natural moves of human arm do distance work

No worry in case if fail during demining (termination of a manipulator) because of low cost of manipulator

Needs electrical power enough from car battery



**Test design of
mobile
manipulator**



3D SOUND SCANNER

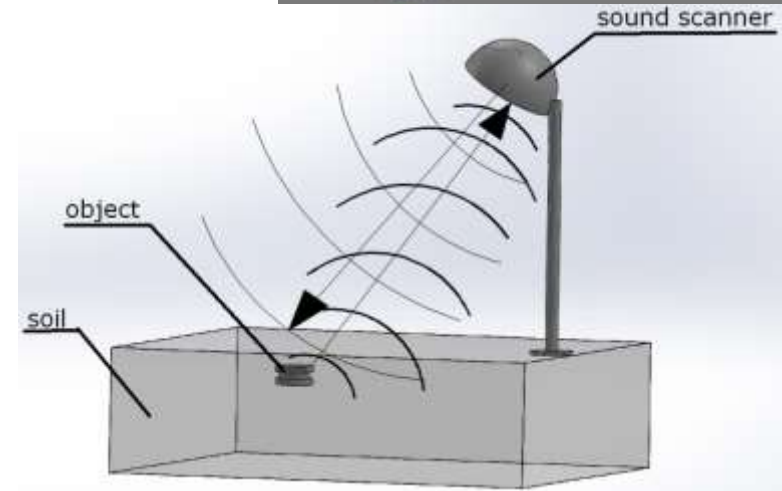
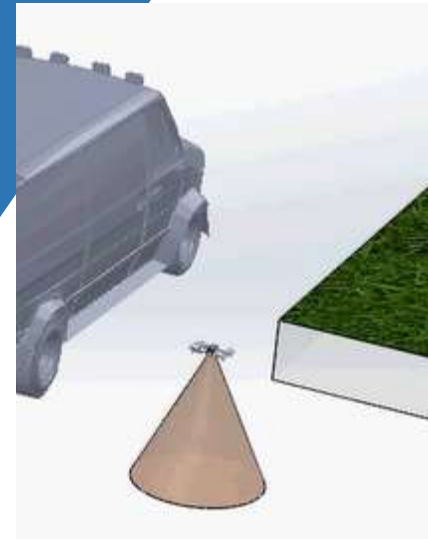
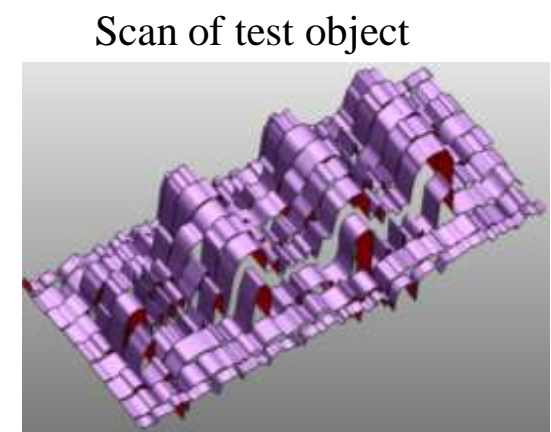
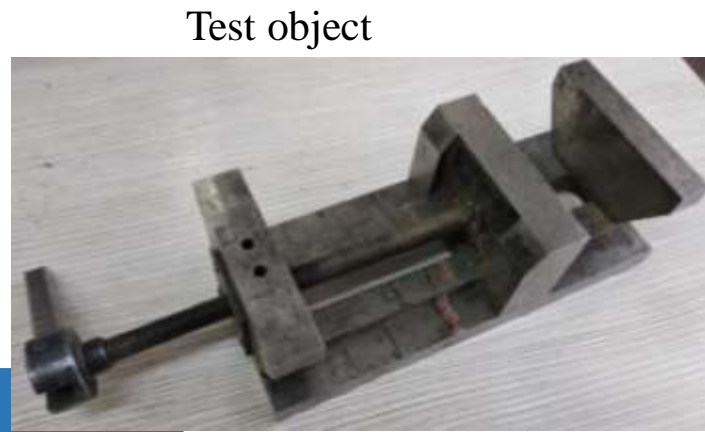
By several sound wave emitters, special equipment and software, the search for objects and cavities hidden in the ground is carried out.

Relevant for sappers when searching for mines and projectiles.

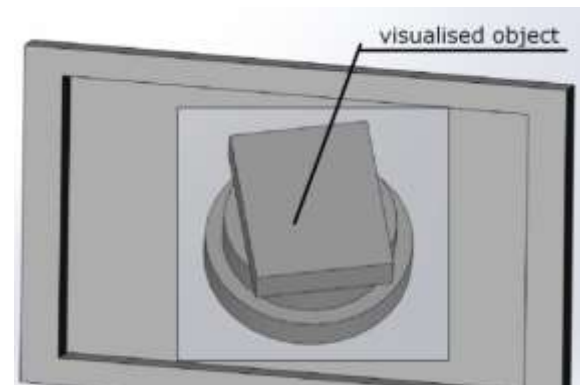
Contactless search for objects under the soil layer.

The ability to search for non-metallic explosive devices.

Visualization of what has been found allows making a decision about the following demining action



Searching process



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INNOVATIVE BIOCOMPOSITE MATERIALS & ADVANCED ECO-PRODUCTS

1. Creation of innovative biocomposite materials intended for the production of biodegradable products and products based on cheap renewable raw materials of plant origin.
2. Development of the composition of innovative biocomposite materials, development of the technology for obtaining eco-products, as well as their introduction into production.
3. Industrial enterprises, businesses and organizations for the production of eco-containers and packaging materials, the sale of environmentally safe products and products for various purposes. As a result, an innovative technology for obtaining cheap and eco-safe biodegradable products and eco-products for various branches of the national economy will be developed.



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DEVELOPMENT AND DESIGN OF A UNIVERSAL ROLL PRESS-BALER FOR PLANT MATERIALS

- The proposed innovative proposal for the forestry and agro-industrial complex allows to create an efficient universal round baler with interchangeable working bodies (installed cutting or picking apparatus, improved variable volume pressing chamber, separate hydraulic drive of the main working bodies, etc.), which has high functional performance in harvesting various plant materials, including energy willow and logging residues.
- Mathematical models and software have been developed for the calculation and design of a universal baler for harvesting energy willow, logging residues, flax, and haystraw.

SolidWorks model of a universal round baler with a cutter bar and an advanced bale chamber

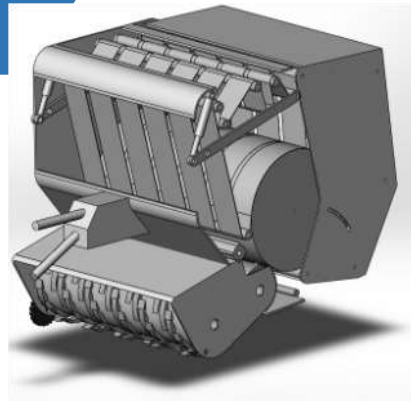
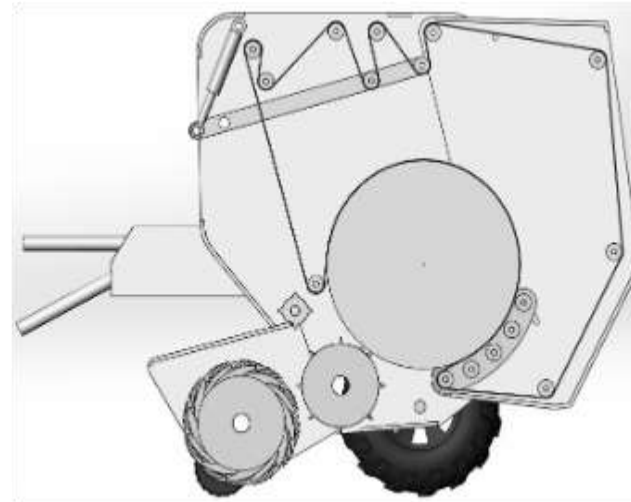


Photo of a universal round baler with a pickup and an improved bale chamber



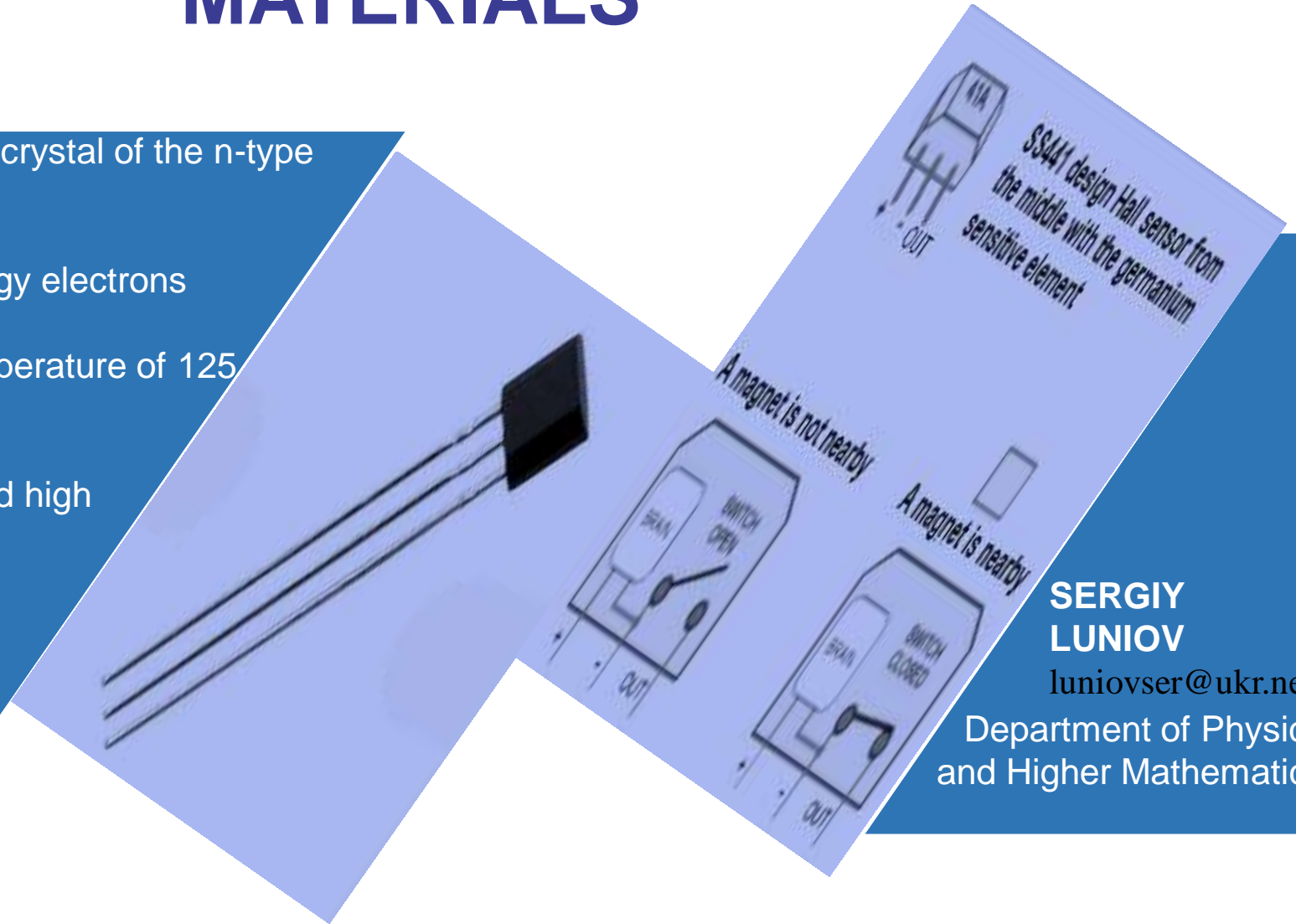
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CREATING THE NEW ELECTRONICS MATERIALS

- Obtaining the germanium semiconductor single crystal of the n-type conductivity
- Irradiation of this single crystal by the high-energy electrons
- Isothermal annealing after irradiation at the temperature of 125 ... 135 °C for 2.5 ... 3.5 hours
- A large coefficient of the magnetic sensitivity and high radiation resistance
- Medicine, engineering, flaw detection, geology studies of new deposits



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A METHOD FOR OBTAINING THE MAGNETICALLY SENSITIVE MICROSENSOR

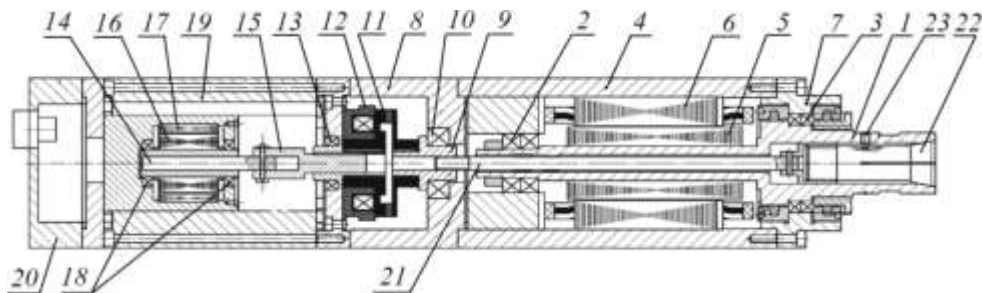




SYSTEMS OF SPINDLE UNITS OF AUTOMATIC MACHINE TOOLS

- Synthesis of structures and subsystems of machine tool spindle assemblies that enhance technological capabilities, productivity, and machining quality.
- Automatic mechanisms for clamping cylindrical workpieces and tools in machine spindle assemblies with improved performance characteristics, in particular at increased rotation frequency.
- Active system for reducing the amplitude of uncontrolled transverse vibrations of rotating elements of mechanisms.

To view the operation of the technology demonstrator, please follow the link https://drive.google.com/file/d/1Tak-j6L8i1knXrL7mDX5VWTH-W6Hy9FT/view?usp=drive_link



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