TERRESTRIAL AND SATELLITE OBSERVING CAPABILITIES, NAVIGATION AND CONTROL IN THE EXACT AGROTECHNOLOGY

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Level of agricultural production, against a background of modern scientific and technological progress requires modernization, creating industries and to attract highly qualified young people in the village.

In agriculture, the use of communication systems and technology is particularly effective in large-scale self-sufficient agricultural organizations in solving optimization problems multifactorial management of the economy and business. To implement these tasks requires an information system operational management, organizational and economic basis of which should be a unified automated information-technological complex based on the convergence of terrestrial and satellite remote sensing, navigation, guidance and control stationary and mobile objects, robotic units, production lines and mechatronic devices.

The main components of the expected economic effect from the introduction of information and communication systems, robotic precision agriculture and livestock: national economic - providing opportunities for growth of agricultural production due to the modernization of material-technical base, increase productivity, the application of modern technologies; Social - giving farmers a wide range of services to the information communication and automation to help improve efficiency in the marketing of products, the choice of technologies for production of agricultural products, as well as socially important services; Corporate - increase in business activity and the agricultural population by combining efforts with other companies and organizations interested in the growth of the volume of agricultural production and included in a single information space of agricultural regions; political and administrative - improving the efficiency of agricultural production due to the transition to innovative technologies using complex mechanization, automation and

computerization of all production operations and production processes, which ensures a high level of consumption and food security.

The purpose of research - used in agriculture unified automated control centers, robotic facilities, mobile units and drones on the basis of video surveillance, local positioning and satellite navigation to ensure efficiency and quality of the implementation of agro-technology processes.

The results of research. The main objectives of the creation of terrestrial and satellite surveillance, navigation and control for precise agro-technologies:

- The creation of conditions for the expansion provided by information and communication services using the results of space activities, experiences and best practices in agricultural industrial development of agricultural regions;

- The development of precise manufacturing technology with the use of satellite communications equipment for digital signal processing and information MEMS and robotic systems, new smart sensor systems, mobile vehicles and units;

- Making available to end users of space activities in the field of remote sensing, satellite communications, use of navigation technologies, unmanned aerial vehicles, computer vision systems;

- Development of new competitive agricultural industrial technologies based on satellite communications, remote sensing, navigation support, tracking and monitoring of moving ground targets using space and ground-based positioning system identification;

- Solving problems of cartography, environmental control, inventory of natural resources, to ensure the rational agricultural practices;

- Ensure international cooperation in the field of information and communication space, human resources development of agriculture.

To implement the project in question require significant resources and time.

The system of measures for implementation of the project

Events on research and development work - the creation of specialized equipment and design offices and research laboratories on the basis of agricultural universities of the Russian Federation.

Construction and equipping of regional dispatch information and

communication centers, and an extensive network of farm management.

Stages of development

The first stage. Formation of priority directions of development of information and automation in high technology. Formation of the market of information services, automated jobs and technologies. Improvement of the structure, functions and the role of information and dispatch management in the performance of work plans, organizational and technical assistance to production units and tractor units, as well as the introduction of computer applications in crop and livestock production. Improve information provision implemented technologies that enhance productivity and reduce time-consuming. Systematization of priorities and functions of the automated information system operational management.

The second stage. Designing information and communication systems, space-based and ground-based monitoring and remote control. Creating databases and knowledge bases, including expert systems, achievements and inventions of scientists, experience of leading agricultural enterprises in production and processing.

The third stage. Ensure implementation of high technology in agricultural management decisions. The introduction of modern means and methods of automated industrial process control using cognitive and sistemnoorganizovannoy information. Robotization agrotechnological processes. Formation of the organizational and financial modernization program branches of agricultural production.

Sharing systems, global navigation, local positioning and intelligent video surveillance

Sharing global navigation systems GLONASS / GPS, RTLS local positioning and intelligent video surveillance ITV can provide new synergies and opportunities for problem solving to improve the accuracy of robotic agrotechnological processes and accompanying this trend economic incremental profits.

Sharing RTLS and GLONASS / GPS allows us to extend control of movement of vehicles and farm machinery on areas where there is no direct visibility of satellites - courtyard, buildings. In this case, there are additional opportunities to control the movement of animals and local staff in production and non-productive areas closed and open.

Sharing RTLS and intelligent video surveillance ITV allows you to combine the possibility of identifying and positioning an object on a label with its visual observation. For example, if the motion sensor detects motion of the object camcorder and RFID signal in field of view cameras while offline, it may mean extraneous motion (not interested) object. You can simultaneously display the operator to analyze the video object in front of a video camera and identify it by the signal label. This approach creates a unique opportunity for automatic object identification for automated surveillance of animal behavior that can significantly reduce the burden on staff, reduce the likelihood of errors or false alarms when the agro-technology operations. Moreover, when integrating RTLS system allows video and data to identify instances of motion of the object with a label that maliciously or negligently readdressed to another object.

Sharing RTLS, GLONASS / GPS monitoring and ITV gives even more options for synergies: in evaluating the individual condition of the animal (identification and location of the animal in the herd, control and accounting of individual animal data, calendaring and history of the animal), in the process of milking (operator control and animal behavior), while feeding (time of eating, chewing food, weight gain), in the process of insemination (identification of sexual hunting, watching calving animal) in the evaluation of the mobility of the animal (control exercise and physical activity animal behavior signs), during the veterinary measures (valuation of identification of diseases, the formation of the calendar veterinary measures).

Sharing global navigation systems GLONASS / GPS, RTLS local positioning and intelligent video surveillance ITV because of the diversity of mobile objects (animals, people, mobile and handling technology), distributed them in space (within the same farm, one farm, district, region), the scale operational and technological processes (number of animals, pieces of equipment, personnel). Accordingly, their priority will change, but the high information content, clarity, efficiency, versatility and universality of analytics component with an increasing function of the clock, long-term, more focused, intelligent observing the behavior of animals and the agricultural industrial infrastructure in the future will be central.

Additional information and analytical capabilities of application of intelligent

video surveillance in livestock

• Conduct surveillance of numerous and varied objects indoors, on the production process lines, while guarding the perimeter and area agricultural enterprises or farm animal.

• Identification of the general state of herds of animals (number of animals, overcrowding and isolation of animal activity and anxiety animal struggle for leadership).

• Inspection of the herd during the grazing, milking, feeding, watering and resting (identifying the strengths and weaknesses of animals healthy and sick).

• Inspection of the herd during housing or group content (determination of the general condition of the animals in groups).

• Observation of animal welfare and of technological equipment.

• Determining the overall condition of the animal (body position in space, solid, body, condition the coat and skin, the presence or absence of discharge from the nose, eyes, vagina).

• Monitoring accented animal behavior and determination of the structure (duration of lying, standing, feeding, watering, movement in the stall, movement in the pasture).

• Detection of an infected animal through a selective examination and observation of behavioral responses.

• Detection of detailed evidence of the passage of estrus and insemination of animals.

• Observation of prenatal and birth signs of the animal in a special room.

• Establish the nature of the disease by careful examination of the animal parts (with enough light in a fixed sequence: the head, neck, thorax, abdomen, udder, uterus, pelvis, extremities).

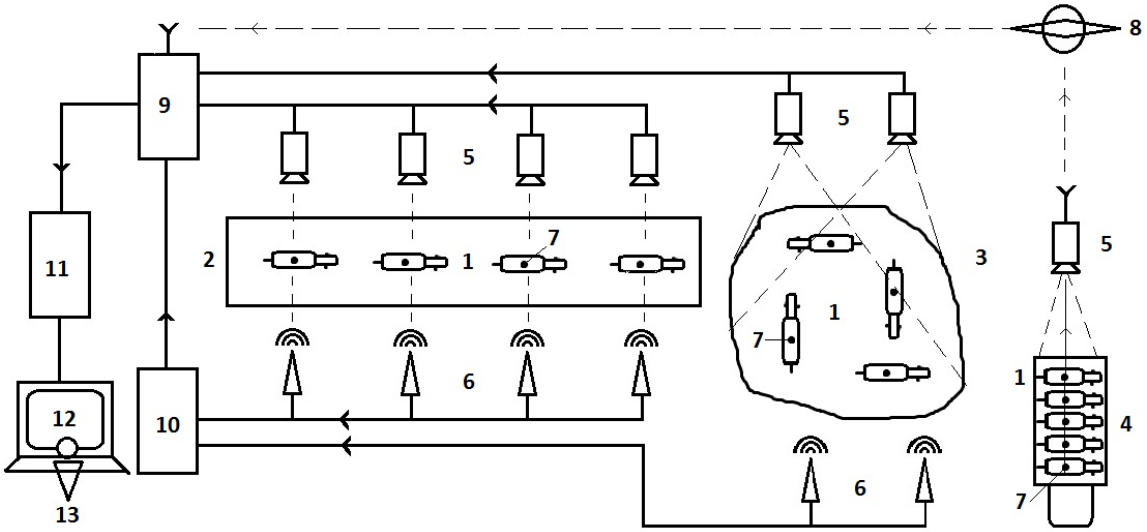
• Thermometric observation.

• Acoustic monitoring by listening

Intelligent video motion detection and behavior of animals with mobile-vehicles

Intelligent video surveillance is based on the integration of three components:

the video subsystem, subsystem positioning and satellite global positioning system. Intelligent video surveillance based on radar data from the sub-system performs automatic determination of the active camera (within sight of where the object is located) and selects the route video. Video subsystem receives the video stream from the active camera and transmits the selected route in the video archive or send the operator. When using the system PTZ video support provides continuous monitoring object for the site of its movement. Using data from the positioning system and video analysis, intelligent video surveillance system performs tracking a particular object without the involvement of the operator. This system can be used, such as cattle farms. The figure shows the structural-functional diagram of the system of intellectual position surveillance of animal behavior.



Structural and functional diagram of the system of intellectual position surveillance of animal behavior and vehicles:

1 - observed the animals; 2 - cattle farm; 3 - backyard playground or pasture; 4 - the vehicle; 5 - camera; 6 - access point, base station radio frequency identification; 7 - tags, RFID tags; 8 - a global positioning satellite system; 9 - positioning server subsystem; 10 - video server subsystem; 11 - video archive; 12 - Monitor; 12 - Operator

On the cattle farm where deployed system, the base stations are placed location and camcorders. An object (animal, human, mobile unit, a vehicle), which was conducted surveillance, secured mobile device - tag (label). The base stations

measure the distance to the tag and transmit the data server subsystem location, which translates them into position. Then, these coordinates are fed to the video subsystem server, which in turn produces from the respective video capture cameras and performs further processing.

Using the proposed system will allow:

• automatically switch video from multiple cameras by analyzing the origin of the observed object;

• record video when motion interested object before the camera;

• receive quality video;

• Desirable to see the object from different angles, corresponding to the main areas of agro-technology processes;

• perform surveillance for each animal automatically, without operator;

• create a video archive on the behavior of each interested object;

• Further refinement of behavioral responses and diagnostic interested object can be carried out by analyzing the image on the server video system.

Conclusions

1. Recent advances in science and technology to create a fundamental prerequisite for the further development and improvement of agricultural production of the robot in the direction of improving the accuracy of the implementation of agro-technology processes.

2. Surveillance most promising method of recording the structural and morphological, dynamic and behavioral characteristics of moving objects agricultural production in their global-local navigation, precise positioning and remote control.

3. Sharing the global guidance, local positioning and intelligent video surveillance in agricultural production will significantly expand the information and control functions agrotechnological automated processes.

3. The system of surveillance and positioning of animal behavior and mobile-vehicles increases the effect of the presence of experts in the areas of production, provides more attention to the state of the object interested and allows constant monitoring of their behavior, and thus exercise more effective control.