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Relative navigation and control of nano-satellites in formation

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The specific tasks of the relative motion control of small satellites in formation are considered. The purpose of control is to shape the ordered group of satellites, operating together to perform the general task. The relative motion control is carried out for satellites moving at very close orbits. The distance between satellites can be around 100 m or less. The purpose of shaping and rebuilding the formation of low-orbit satellites is to solve various practical tasks for monitoring the earth's surface, creating stereo images, building large-diameter telescopes, creating the data exchange channel between two points at the surface and others. The latest advances in avionics and other fields of science and technology led to the possibility of miniaturization of almost all spacecraft service systems without any loss of their functional performance. Precise estimation of the relative position of satellites is one of the main problems of formation flight. To determine the relative phase state of the satellites in a group, the processing of video images obtained by shooting one satellites using a video camera installed on another vehicle is often used. A new optical system of relative orientation and navigation is considered. The relative orientation and navigation 6 parameters of the controlled satellite are calculated from the image coordinates of the special contrast points of the main satellite on the camera matrix. The measured parameters are used to implement the optimal control law for the motion of CG of the controlled satellite. The control forces are created by miniature actuators. The results of the simulation and experiments are discussed.

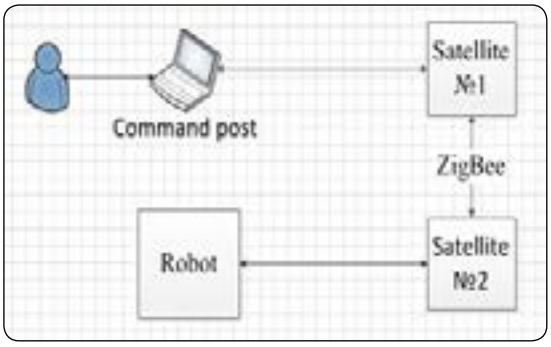

Figure 1: Remote Robot Control System on the base of two nano-satellites

Biography

Alexander V Nebylov has few Degrees to credit including: Title of the Honorary Scientist of the Russian Federation; Decree of the President of Russian Federation of 2006; Academic rank of Full Professor since 1986; Doctor of Science Degree in information processing and control systems since 1985. His scientific field of interest include: motion control theory, control systems and avionics. He the author of 18 books and more than 300 scientific papers and inventions, leader of many Research and Development in aerospace instrumentation. He is a Chairman of Aerospace Devices and Measuring Complexes, State University of Aerospace Instrumentation in Saint Petersburg and Director of the International Institute for Advanced Aerospace Technologies, Russia. He is a Member of the leadership of the IFAC Aerospace Technical Committee since 2002.

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