5. Division of traffic and pedestrian passages at different levels (arrangement of underground passages and parking lots).

High-density housing system is characterized by:

- Effective planning and maximum engagement of land fund;
- Clear division of traffic and pedestrian zones, absence of automobiles access into inner yards;
- Modern infrastructure which is not dominant;
- Housing blocking which separates public and private spaces;
- Public function, trade facilities and welfare support on ground floors;
- Flat planning is based on flexible principles and is individual for every resident.

The following directions may be considered to be vastly prospective in the domain of high-density housing use:

a) Development of the sites with complicated landform;

b) Use of non-housing stock roofs;

c) Housing stock tightening within available housing units at account of high-density.

Thus, we have analyzed national and foreign experience of increasing residential housing density and detected modern planning features of high-density medium-rise residential buildings.

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CORRELATION-EXTREME SYSTEM OF INERTIAL DEAD RECKONING CORRECTED BY LINEAR LANDMARK

The purpose of the work is to solve the problem of external orientation by searching linear landmarks on images of geophysical field, received from UAV.

Currently existing navigation systems of unmanned aerial vehicles (UAVs) are characterized by a high dependency on the information received from the satellite navigation system (SNS), such as GPS/GLONASS. Application of these

systems has several limitations. Firstly, the need to ensure the required accuracy of position detection, and secondly, the possibility of using by opponent SNS signal suppression systems. In nowadays more and more systems of electronic warfare with UAVs using GPS-spoofing are gaining traction. A GPS spoofing attack attempts to deceive a GPS receiver by broadcasting counterfeit GPS signals, structured to resemble a set of normal GPS signals, or by rebroadcasting genuine signals captured elsewhere or at a different time. These spoofed signals may be modified in such a way as to cause the receiver to estimate its position to be somewhere other than where it actually is. Therefore, the problem arises of developing an additional source of navigation information, which should allow positioning of UAV at the times, when the information is not available from the SNS or does not provide the required positioning accuracy. As such, a source of navigation information is proposed to use computer vision system. To decrease the growth of the inertial system errors proposed intermittent correction of dead reckoning with a more precise technology. The method of inertial dead reckoning with the correlation-extreme was used. In this work, attention is focused on the research of adaptability of correlation-extreme navigation system (CENS) for the correction operation of an inertial navigation system (INS). After all, it is proposed to use CENS as duplication of satellite navigation system (SNS) in the case of interference in the reception of satellite signals. For this case offered a simplified block-diagram of CENS, where GPS receiver is an optional unit and used as a fallback. A search algorithm for the most extended landmark by which UAV can be followed by and implemented flight correction.

The relevance of the work lies in the fact that correlation-extreme navigation system is the most advanced information processing systems that allow managing the movement of an object along a predetermined path. The principle of operation is based on a comparison CENS image the Earth's surface or set of guidelines – the current image with a reference image, obtained earlier. As a source, carrying information about the position of the object relative to the navigation of the observed area of the earth surface, can serve as a natural relief field. So far, unmanned aerial vehicles (UAVs) are the efficient means of intelligence and civilian use. Then dead reckoning is the main system, which runs on the board of INS and has a problem that with time accumulate an error if it is not corrected. Also SNS is the most common variant of INS correction and recognition by ICAO and conforms to it requirements, but SNS is not satisfied by the fact that the satellite signal receiving is not reliable, not always available, as well as important for military operations that GPS and GLONASS are the property of other countries. That is why it has been offered an alternative variant of correction using CENS. The principle of operation of CENS is processing of successive frames received by the camera or radar. Considering the INS correction algorithm for linear landmark is the task to allocate a linear guide with the help of visual image processing. The dead reckoning method is based on

continuous calculation of aircraft trajectory by velocity vector data (integration of measured velocity vector in time or double of acceleration relatively the ground surface) taking into account the initial coordinates. It is proposed to consider the method of inertial dead reckoning with correlation-extreme method. Moreover, research of INS correction algorithm based on computer vision. In addition, significant number of basic algorithms is developed, based mainly on the radar system, and implemented, but without appropriate accuracy level. However, it still cannot regard this problem as finally solved due to reason as algorithms that are more powerful exist, but rarely used, because its requires large computational cost. So, it is needed to build such algorithm that could corrected INS with lower computational cost and higher accuracy. For this purpose linear landmark detection algorithm for INS correction is developed. *So*, the analysis of the effectiveness of the INS correction showed that the algorithmic software is appropriate for use on UAV board and due to applying computer vision systems, gives as correct results of location determining as possible.

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PRELIMINARY PILOT TESTING

The work of pilot is one of the most difficult activity, that why the training is difficult as well. The process of professional training includes a lot of instruments and devices. The level of training should mainly guarantee safety. Accident analysis and preconditions shows that factors such as the mistakes in flight operations, errors in piloting techniques and operation of aviation equipment determines the overall accident rate. This causes the need to improve the organization of flight training for flight crews.

Aviation training process includes many elements, each of which has its own purpose. Simulator as part of the educational process and training plays an important role in training aviation specialists not only in the final stages of training, but also during knowledge and skills testing.

One of the stages to obtain a license of pilot after theoretical knowledge verification is computer testing. The approach of the future pilot's professional knowledge verification save time of the candidates and excludes subjectivity at the evaluation. The candidates must show their knowledge and skills (for example, knowledge of the main laws of aeronautics, flight training, knowledge of mathematics, physical or computer science, engineering, technical management etc.).