FLYING ROBOTIC SYSTEM

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Flying service robots have the features of a pilotless system equipped with technological upgrade necessary for a performance of a required work assignment. The development and primary application of such service robots are related to their use.

K e y w o r d s. : flying service robot, service robots, locomotion subsystem, Engine hood functional system, External sensor, Internal sensors

1 INTRODUCTION

One of the areas of the new application domain of robots is the area of service activities, that is, the activities which do not contribute to the industrial production of goods, but are useful to people or for operating and technical systems e.g. service robots for movement in the air.

The features of the flying service robots are as following: action performance / work – technological, autonomy), mobility (movement in the air space, movement autonomy), control and navigation performance (control, programming, movement and acting intelligence, autonomy, communication human / robot / surroundings), operational and application efficiency (usage, acquisition and operational costs, alertness, maintenance, reliability, safety).

A special feature of the flying service robot is its ability to move (fly) autonomously, intelligently and automatically in the air space. This feature of the service robot is functionally implemented by the locomotion subsystem, which is the basic mechanical system of the service robot. Its function is to implement a programmed and operationally controlled flying in various flight modes, as well as the stability of the service robot during its movement and performance of its work assignment.;

2 LOCOMOTION SUBSYSTEM

The general requirements for locomotion subsystem are mainly: movement in given (all) directions, immediate(time, geometric) change in the movement direction, high maneuvering ability in a limited space, high movement dynamics, high maneuvering contour dimensions, climb ability, stability(static dynamic,...) etc.

Locomotion subsystem can be structured based on biological models (inspired by bird and insect movement, by animal locomotory system), or else based on artificial models (inspired by the historical development of aviation technology, by technical elements of the airplane, helicopter, ...).The design of the locomotion subsystem itself significantly influences the structure and design of the entire service robot. Based on the updated general knowledge about the flying service robots, as well as the analysis of their contemporary design, it is possible to develop a system model for locomotion subsystem of the service robot, and formulate the structure of the system features of this subsystem. The locomotion subsystem of the service robot can be defined as a structural arrangement of mutually dependent functional groups which are placed into system model based upon their function.

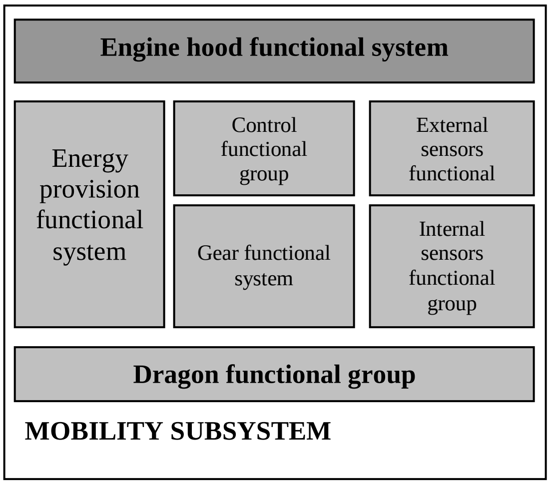

Fig. 1: Systemic model of flying service robot

Functionally independent – but structurally dependent group providing aerodynamic umbrella for all the locomotion subsystem groups and their protection against the impacts of work environment, as well as the protection against the interference by unauthorized individuals. At the same time this group also creates a design of its own service robot.

External sensor functional system– functionally independent, but structurally dependent group of aviation sensors insuring the interaction between a flying service robot and its surrounding, or in selected cases, also with technology and performance of a service assignment. This group is a part of the conceptual design of the external sensors subsystem, as a functional entity.

Internal sensors functional system – functionally independent but structurally dependent group of sensors insuring the monitoring of selected internal functions and parameters of locomotion subsystem. This group is a part of the conceptual design of the internal sensors subsystem, as a functional entity.

Control functional group – functionally independent but structurally dependent group composed of necessary HW (hardware) a SW (software) intended handle programs, automatic control and navigation of service robot (substituting the function and task of a pilot). This group is sometimes identical with the control and navigation subsystem of the service robot.

Energy provision functional group – functionally independent but structurally dependent group composed of corresponding energy sources, elements, nodes a distribution points to provide energy for the reliable service of the entire service robot. This group is sometimes identical with the service robot energy provision subsystem.

Gear functional system – is a functional group which supplies energy needed to overcome the air resistance and to achieve the required prime speed, functionally and structurally dependent group for the use of the on-board gear source, or based on the level of dependence on the on-board gear source; in relation to the flying SR, it can be designed as:

- Engineless concept
- Engine concept comprised of gear aggregates / units (one or more engines) with accessories to be built into a dragon, including the propeller (for propelling units). Ensures the supply of the primary energy for the movement of the service robot, that is, the education of the lift force and overcoming the flight resistance. Usually, this is the mechanical energy of the rotational movement, which is added in its final form to the active members of the respective locomotion subsystem mechanisms.

3 CONCLUSION

Flying service robots are conceptually and structurally derived from aviation technology. The movement mechanics of a flying service robot is derived from the mechanic of an airplane flight, the structure of a flying service robot is determined by its purpose and its task. Therefore, when building a flying service robot, it is advisable to follow the basic principles of an airplane building. The design of locomotion subsystem significantly influences the structure and the design of the entire service robot.

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