UDC (07)621.7:621.8

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THE PROPOSAL OF MODULES FOR INTELLIGENT END-EFFECTORS

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ІНТЕЛЕКТУАЛЬНІ МОДУЛІ ДЛЯ ВИКОНАВЧИХ МЕХАНІЗМІВ

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ИНТЕЛЛЕКТУАЛЬНЫЕ МОДУЛИ ДЛЯ ИСПОЛНИТЕЛЬНЫХ МЕХАНИЗМОВ

The article, deals with construction design end effectors use of industrial robotics. Focuses on increase their intelligence through internal and external sensors. It uses DC actuators equipped with an accurate reducer, which ensure a high positioning accuracy of the resulting movement end-effector. Actuators allows to realize compensations to ensure correct positioning, and perform the required technological activities.

Key words: *modules end-effectors, sensor, intelligent.*

Fig. 5. Bibl.: 4.

Розглянуто конструкцію виконавчих механізмів використання промислової робототехніки, запропоновано підвищення їх інтелекту на основі внутрішніх і зовнішніх датчиків. Використовуються DC приводи, оснащені точним редуктором, які забезпечують високу точність позиціонування результуючого руху робочого органу. Датчики дозволяють зменшити пошкодження, забезпечити правильне позиціонування, а також виконувати необхідні технологічні роботи.

Ключові слова: *модулі робочих органів, датчик, інтелектуальний.*

Рис.: 5. Бібл.: 4.

Рассмотрена конструкция исполнительных механизмов использования промышленных робототехник, предлагается повышение их интеллекта на основе внутренних и внешних датчиков. Используются DC приводы, оснащенные точным редуктором, которые обеспечивают высокую точность позиционирования результирующего движения рабочего органа. Датчики позволяет уменьшить повреждения, обеспечить правильное позиционирование, а также выполнять необходимые технологические работы.

Ключевые слова: *модули рабочих органов, датчик, интеллектуальный.*

Рис.: 5. Библ.: 4.

Introduction. The basic task of this application is to design of intelligent positioning modules for end-effectors allowing to correct inaccuracies in the movement of the robot. Addressing these modules it is based on the use of intelligent drive consisting of a motor, precision gearbox and suitable sensor technology. The drive will move in two or three translational and rotational axes. Motion control will be implemented on the basis of information obtained from sensors placed directly for drives of positioning module, as well as the sensor working environment according to the specific requirements for each application.

Parameters and characteristics of the proposed solution. Basic parameters are based on the concept for the development of micro-motion module MT and MR of based applications TS / DS produced in SPINEA. The proposal is based on the use of precision reducers TS series 30-70 and their application in the corresponding DS. The development has been solved for the type of dimension series with a uniform standard mechanical INTERFACE (clamping flange). Describes the individual elements intelligent end effector, Fig. 1 [1].

The basic parameters that must be proposed module meets can include:

– maximum load up to 20 kg,
– maximum weight of 40 kg,
– positioning accuracy minimal 0.01mm,
– torque minimal 18 Nm,
– maximal speed compensation 1 mm/s,
– use of electric drives.

Proposal applications in deployment modules to end effector for robot assembly operations is based on the requirements of motion compensation in the axis perpendicular to the movement of the gripper jaws. If we want to increase the availability of robotic device, it is appropriate to have the possibility of deployment of various types of gripper and technology heads. The arrangement of the individual parts of the proposed gripper is shown in figure 2.

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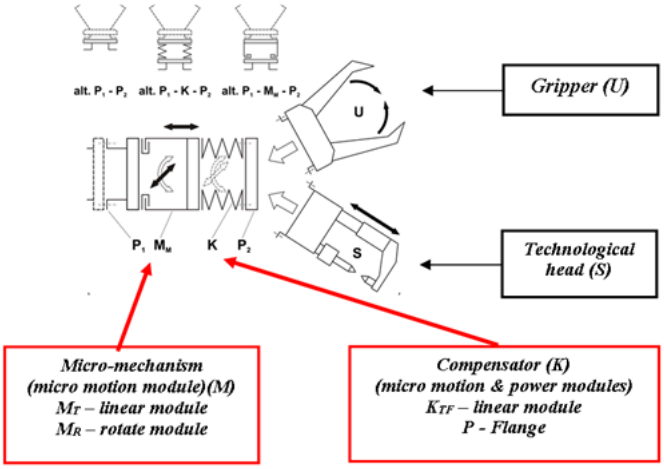

Fig. 1. Intelligent gripper and technological head

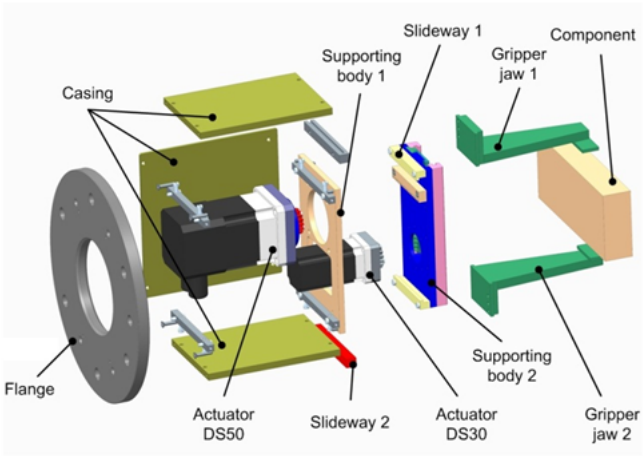

Fig. 2. Arrangement of individual parts gripper

As an example, the joining of two metal components into permanent joints, with the need to achieve a quality finish for their connection. In this case, we can use the exchange system effector allowing a single robot to carry out two operations (e.g. arc welding and grinding of weld, Fig. 3) [2].

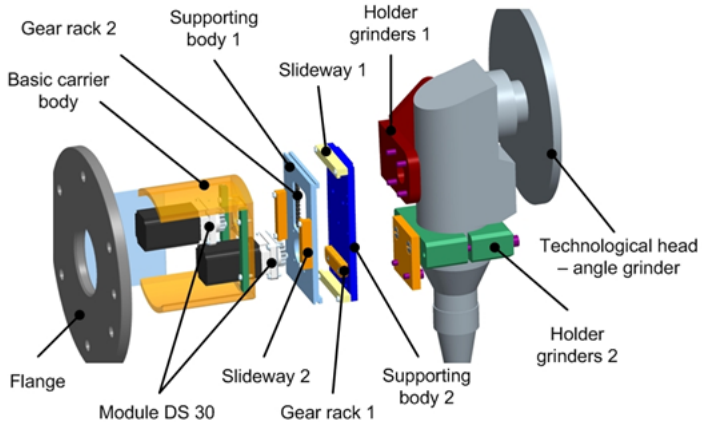

Fig. 3. Modular palletizing – assembly workplace

For these types of operations are requested various conditions on the parameters of the robot. In welding is necessary to allow the robot to carry out an oscillating movement, reaches an average accuracy, while its load capacity may not be large (welding torch has low weight). For grinding load capacity of the robot is an important parameter that depends on the used grinder (belt, angle grinders), shall be the greater accuracy with an oscillating movement can be used but it is not a requirement [3].

The most appropriate way to address this application is the deployment of a robot even with less overall accuracy (of using robots whose parameters of the precision are worse as precision of robot at it becomes operational), the price range is smaller. The compensation the lower the accuracy of the robot can be realized by deploying intelligent compensatory heads to move the axes X, Y (or Z) would enable this disadvantage to suppress [4].

This way of solving the precise movements of the robot in space, especially for achieving accurate final coordinates can be applied in various industries, to solve various technological operations (milling, drilling, thread cutting, polishing, etc.).

Connection diagram of intelligent end effectors. The scheme of wiring of sensor technology for robot end effector based on the involvement of the DC motor (actuator) gearbox for a servo inverter, as well as the connection of external sensors, making it possible to increase the intelligence of the drive module effector. Between the sensors that increases the intelligence of end-effectors, we include: The torque sensor (force), temperature sensor, acceleration sensor, microphone, counter rotation of direction, voltage and current sensor. Proposed wiring diagram is shown in Fig. 4.

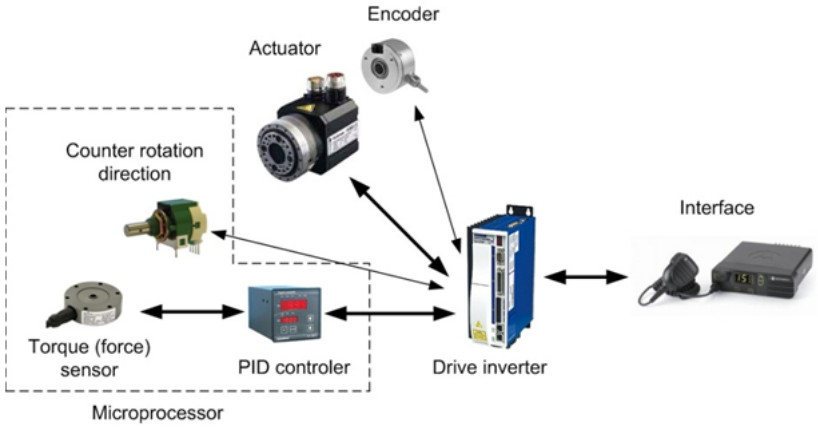

Fig. 4. Connection diagram

Example of location of the sensors to the drive module DS 50 end effector, layout display the various sensors, the individual sensors are placed either directly on the actuator or a servo inverter, (Fig. 5).

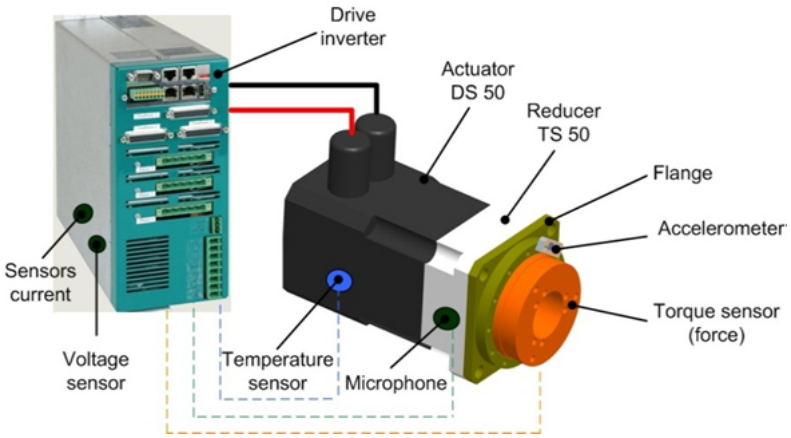

Fig. 5. Location sensors

For applications aimed at positioning (precise positioning parts), it is appropriate to use sensors, allowing to follow the torque values. In the case of exceeding the limit values leads to interruption of work in workplace or control system allows to compensation speeding values torque moment (Application: screwdriving).

In applications where there is a pressing, or assembled parts with zero tolerance is appropriate to add to the end effector force sensor that enables capture to axial forces. After

exceeding the limit value is used to stop the movement of the device, or sending information to control system that compensates, for example: Move the axes X and Y (micro-movements).

For applications where there is action in two directions, for example: grinding, sensing equipment can monitor not only the movement in the axial as well as radial direction. In case of using sprung technological head - grinding to fine correction to achieve the desired quality of cut surface.

Conclusion. The deployment of suitable sensor technology can be achieved by increasing the accuracy of the resulting end-effectors of industrial robots. Use of micro-effector mechanism allows you to use less precisely the types of robots or robots in a smaller number of kinematic pairs. That solution, end effectors for manipulating objects, as well as for grinding has been experimentally verified on a pair of robots Kuka VKR 125.

This publication is the result of the project implementation: Research modules for intelligent robotic systems (ITMS: 26220220141) supported by the Research & Development Operational Program funded by the ERDF.

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Semjon, J., Vagas, M., Balaz, V. (2016). The proposal of modules for intelligent end-effectors. *Technical sciences and technologies*, no. 4 (6), pp. 174-177.