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## Screw-Nut Robotized Assembling

*At present, industrial robots are frequently used in assembling operations. This paper presents a simple screw-nut assembling performed by a robotic arm with a 2-finger gripper.*

### 1. Introduction

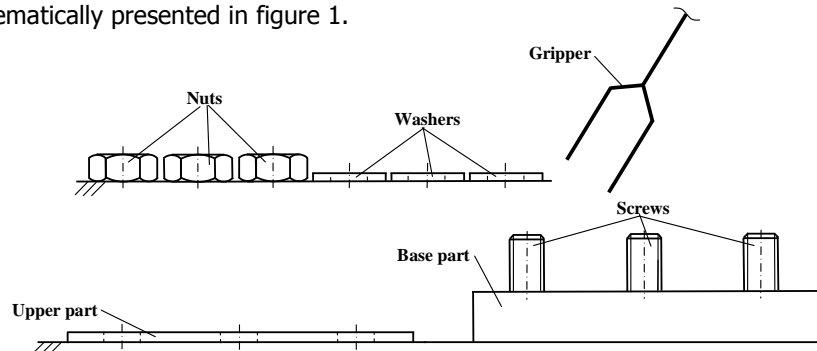
The robotized assembling has the following main advantages:

- flexibility - robots can easily adapt to the changing of assembling task;
- high productivity - robots can work ceaselessly, without pauses (except calibrations and maintenance);
- better performance - higher accuracy and repeatability;
- savings - created by eliminating downtime and decreasing labor costs; as a result the return of investment is high.

Having the assembling parts and the robot for the assembling task, the assembling steps and the position-orientation of the assembling parts are established. A common dismountable assembling is the one made by screw-nut.

As an example, the assembling of an upper part on a base part by three screw-nut sets with washers is considered.

The assembling parts in the initial state and the robot's gripper are schematically presented in figure 1.



**Figure 1.** The assembling parts in initial state.

## 2. Lynxmotion 6 Robotic Arm

In the application, a Lynxmotion 6 Robotic Arm is used. It has 5 degrees of mobility (base rotation, shoulder, elbow, wrist motion, wrist rotation) and gripper drive.

According to [4], the robotic arm contains ultra-tough laser-cut Lexan structural components, black anodized aluminum servo brackets and custom injection molded components.

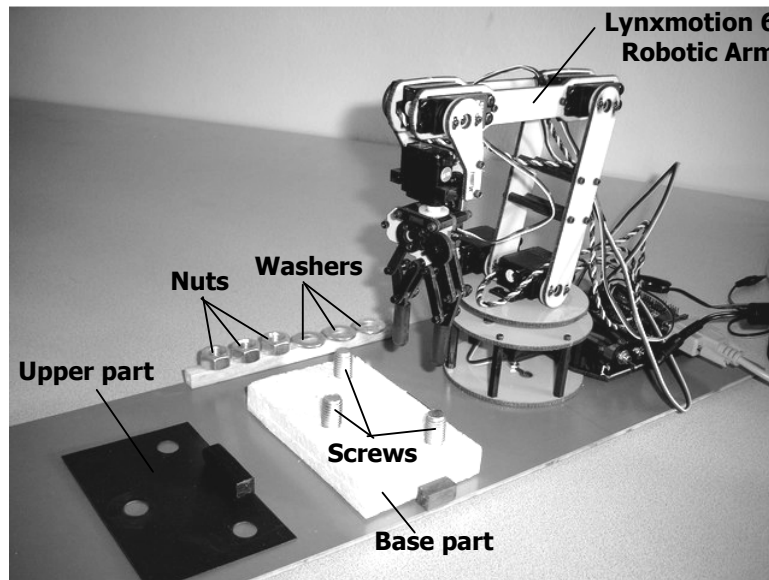
The drive is realized by servo motors (one Hitec HS-422 for the base, an HS-85 and a HS-81 for the gripper and four HS-475 for the rest).

For the command, RIOS (Robotic arm Interactive Operating System) software is used. This is a Windows program for commanding the robotic arms with the SSC-32 servo controller. With RIOS, the robot can be taught sequences of motion via the mouse or joystick. The inverse kinematics engine makes positioning the arm effortless.

This program uses external digital and analog inputs to affect the robot's motion for closed loop projects. If-then, for-next, and do-while, are supported for the inputs. External outputs can also be controlled. This can work with an I/O Gear USB to serial cable.

## 3. Screw-Nut Robotized Assembling

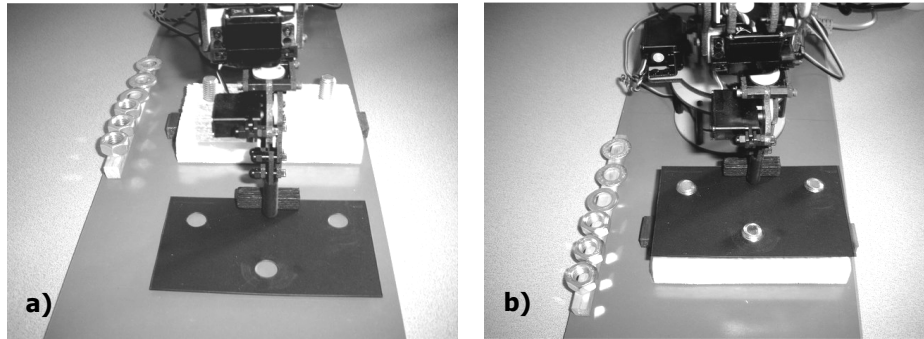
The assembling parts and Lynxmotion 6 Robotic Arm are presented in figure 2.



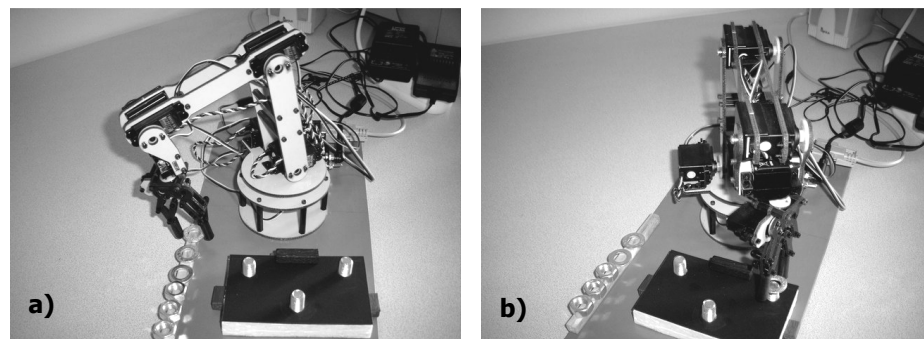
**Figure 2.** The assembling parts and Lynxmotion 6 Robotic Arm.

- The assembling steps are as follows:
- the handling of the upper part over the base one;
  - placing the washers on the screws;
  - screwing the nuts.

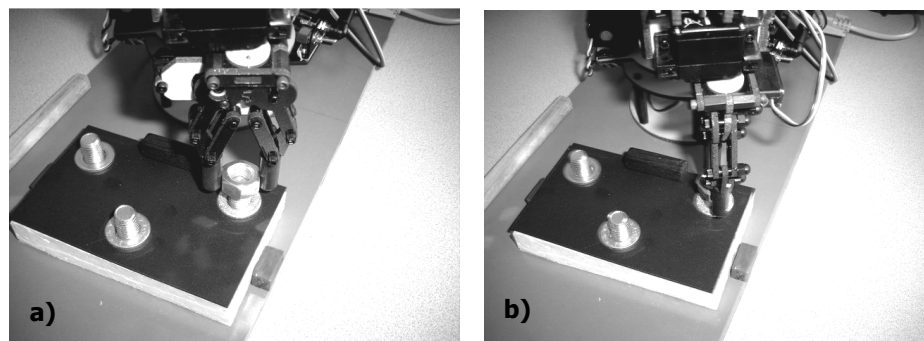
Some assembling steps are presented in the figures 3-6.



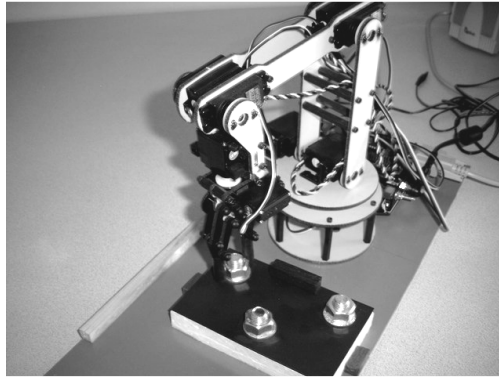
**Figure 3.** Assembling the upper piece over the base one.



**Figure 4.** Assembling the first washer.



**Figure 5.** Screwing the first nut.



**Figure 6.** Finishing the assembling.

After the last nut is screwed, the assembly is finished.

#### **4. Conclusions**

In the paper were presented some robotized assembling aspects, particularly for the screw-nut assembling case.

The assembling of an upper part on a base one by screw-nuts with Lynxmotion 6 Robotic Arm was presented as an application.

#### **References**

- [1] Kovacs F.V., Rădulescu C., "Roboți industriali", Vol. I and II, Universitatea Tehnică Timișoara, 1992;
- [2] Kovacs F.V., Varga Șt., „Fabrica viitorului”, Ed. Multimedia International, Arad, 1999;
- [3] Kovacs F.V., "Introducere în Robotică", Ed. Printech, București, 2000;
- [4] [www.lynxmotion.com](http://www.lynxmotion.com);
- [5] [www.robots.com](http://www.robots.com).

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