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1. Theoharis BABANATSAS, 2. Dan GLĂVAN, 3. Roxana Mihaela BABANATIS MERCE

CONCEPT OF AN AUTOMATING OLIVE HARVESTING SYSTEM

1-3. Faculty of Engineering, University "Aurel Vlaicu" Arad, ROMANIA

Abstract: The agricultural industry is very complex and need a lot of attention and qualified employments. Agriculture is a seasonal, highly mechanized activity. The only activity that takes place throughout the year is farming. For other types of activities, the use of automated systems is not always profitable. Harvesting using manpower requires employing a large number of people for a limited time, which may lead to social problems in addition to high labor costs. The big problems of employments are that there is activity only seasonal and are hands work. The same think is in grove-olive, where necessary many workers with experience to collect olives with their hands. In this case take a lot of time to collect the entire olive grove. For increase production of olives is necessary to collect the olives mechanics with robots. The use of such robots is also justified by people's need to adjust to their environment, adjustment to a certain purpose meaning the increase process of the interaction productivity, by decreasing the necessary effort and increasing the quantity and quality of the environment output.
Keywords: agricultural industry, olives, production, collects, seasonal

INTRODUCTION

Today we can find the automated systems and the robots in a large range of purposes like home appliances, medicine, and mechanical industry. In last years automated systems and robots have find range also in agricultural industry.

The use of such robots is also justified by people's need to adjust to their environment, adjustment to a certain purpose meaning the increase process of the interaction productivity, by decreasing the necessary effort and increasing the quantity and quality of the environment output.

Agriculture is a seasonal, highly mechanized activity. The only activity that takes place throughout the year is farming. For other types of activities, the use of automated systems is not always profitable. Harvesting using manpower requires employing a large number of people for a limited time, which may lead to social problems in addition to high labor costs.

Market competition in agricultural products demands low production costs, and this is achieved by using automated systems. Considering the complexity of the harvesting operations, there are special requirements such as hand-eye-brain type interventions. Therefore, these automated systems should consist of robots.

Fruit and vegetable harvesting is mainly carried out by mobile robots, which are fitted with shape, quality, and location-recognition devices, and with suitable equipment.

Figure 1. Olive trees in plantations.

Olive trees are currently grown in plantations (picture 1, 2). All the physical features of the soil, as well as of the people and technology involved in the processing must be taken into consideration for such a plantation. The olives are picked manually, beginning with September 24th, for 15 to 20 days,

from 07:00 until 16:00. A group of 3-4 people is necessary for each tree.

Figure 2. Olive trees in plantations
natural harvested

A group harvests 6-7 trees per day, which yield 260 kg of olives. Therefore, a plantation with thousands of trees requires a large number of people, which leads to high costs of the harvesting process.

Olives have been harvested and processed in much the same way, ever since ancient times (picture 3). After they are harvested, in order to prevent them from being bitter, the olives are sunk in water and salt, then held in vinegar for several hours, and then stored in oil.

Due to the economic and social importance of olive trees, it is necessary to design and manufacture an olive-harvesting robot, thus eliminating human operators, which are employed in large numbers for a limited time. Consequently, harvesting costs decrease, this being reflected in the final product.

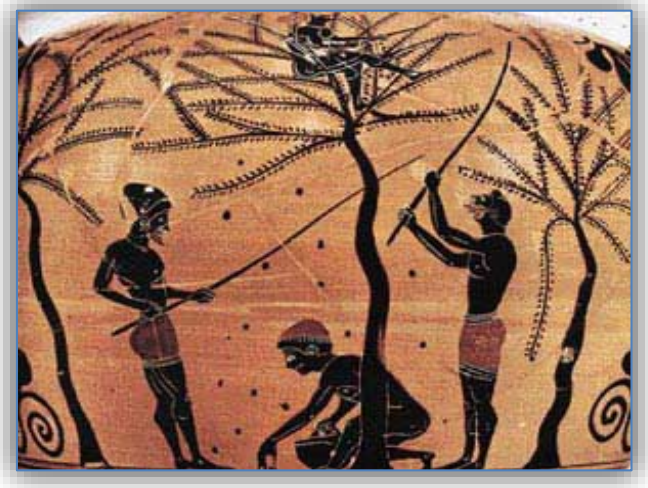

Figure 3. Olive trees and their harvested
and processed.

ROBOT SCHEMATIC

The robot consists (picture 4) and principle are the shaker which shakes the olive tree branches, the net which is operated by an arm, the shaker and the net being connected by sensors, the mobile platform and the trailer in which the harvested olives are discharged. The video camera recognizes the work area for the shaker, if we use an autonomous system, or it recognizes the work area for the human operator, if we use a remote-controlled system.

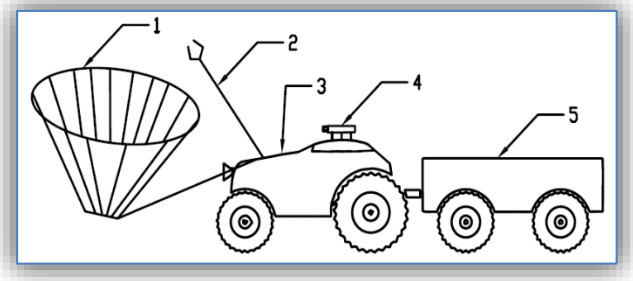

Figure 4. The concept of harvesting robot.
1. Net "umbrella"; 2. Shaker for olive tree;
3. Autonomous (or with driver) mobile platform;
4. Data transmitter and receiver with video camera;
5. Trailer for olives.

DESCRIPTION OF THE TECHNOLOGICAL PROCESS

The robot (2) recharges its battery from the power supply (5) located in the storage area (1) where the olives are stored. The robot harvests the olives from each tree separately, and when the trailer is full (approximately 50 trees, at 60 kg/ tree), the robot goes to the storage area using the reference points.

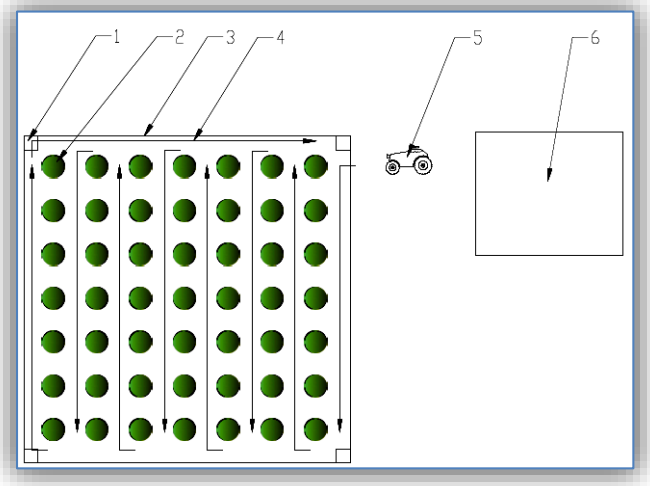

Figure 5. Description of the technological process.
1. Reference points Storage area - power supply; 2. Olive trees Robot; 3. Olive trees plantation; 4. Harvesting flow Reference point; 5. Robot – harvest machine; 6. Storage area, power supply and robot control room.

The olives are harvested by shaking the olive tree branches. This robot can operate autonomously, the greatest advantage in this case being the

elimination of the human operator, and therefore higher productivity, but also extremely high development and manufacture costs for such a robot, or it can be remote-control operated (picture 6).

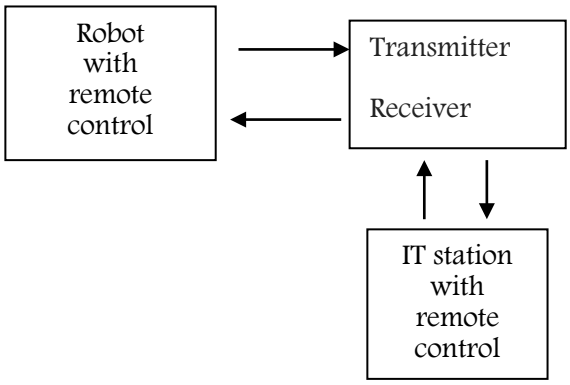

Figure 6. Remote control systems, this system can be used by one human operator

CONCLUSIONS & REMARKS

In the latter case, a human operator is necessary to operate the system. The robot will be fitted with two video cameras, one used by the robot to move around the plantation, and the other to recognize the olives and shake the tree branches.

This robot should be designed with a built-in olive storage bin. It will have a mobile platform fitted with a shaker arm, which will have a sensor to detect the branches and the olives. An additional arm is necessary, fitted with a net to collect the olives which fall off the trees, and with sensors which will allow it to position itself under the braches shaken by the shaker. A trailer is also necessary, to store the harvested olives. The navigation system can be autonomous, using the global positioning system, or remote-controlled by a human operator. It is powered by electricity from batteries, which are recharged at the end of the day.

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