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Fruit Sorting Machine

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Abstract: - *The fruit and vegetable market are getting highly selective, requiring their suppliers to distribute the goods according to high standards of quality and presentation. In the last years, a number of fruit sorting and grading systems have appeared to fulfil the needs of the fruit processing industry. Present sorting systems tend to include the development of an electronic weight system and a vision-based sorting and grading unit which also measures size, with a friendly user interface that enables definition of classification parameters, reconfiguration of the outputs and maintenance of production statistics. Some commercially available systems are approaching this objective, but prices are becoming almost prohibitive for small and medium companies that try to maintain competitive levels. Most of the systems we can find in the market are based on special architectures, for instance, DSP-based processors boards, hardware implementation of special purpose algorithm, VME architectures, etc. This is the case of many Spanish fruit packing companies, which are usually small, agriculture products are quite price-sensitive, and they suffer from a hard competitive market like the European Union. The work we are presenting in this paper is the result of a project partially funded by an agricultural machinery company, Previous work done by the same team was directed to integrate existing control and weight systems, but they were limited by the capabilities of that system, trying to reduce costs by using special purpose image acquisition devices designed for the project.*

I. INTRODUCTION

The fruit and vegetable market are getting highly selective, requiring their suppliers to distribute the goods according to high standards of quality and presentation. In the last years, a number of fruit sorting and grading systems have appeared to fulfil the needs of the fruit processing industry. Present sorting systems tend to include the development of an electronic weight system and a vision-based sorting and grading unit which also measures size, with a friendly user interface that enables definition of classification parameters, reconfiguration of the outputs and maintenance of production statistics. Some commercially available systems are approaching this objective, but prices are becoming almost prohibitive for small and medium companies that try to maintain competitive levels. Most of the systems we can find in the market are based on special architectures, for instance, DSP-based processors boards, hardware implementation of special purpose algorithm, VME architectures, etc. This is the case of many Spanish fruit packing companies, which are usually small, agriculture products are quite price-sensitive, and they suffer from a hard competitive market like the European Union. The work we are presenting in this paper is the result of a project partially funded by an agricultural machinery company, Previous work done by the same team was directed to integrate existing control and weight systems, but they were limited by the capabilities of that system, trying to reduce costs by using special purpose image acquisition devices designed for the project.

Thus, the idea was to build a new system integrating in a flexible way all parts (mechanics, control, weight and vision) of a fruit sorter. From the very beginning there was the criterion that the system should be conceived as an open platform ready to evolve and incorporate, without major changes, new requirements from the customers or simply an upgrade of any of its modules to avoid the obsolescence of its design or components. The knowledge in the computer vision field has made a significant progress in the last years and hardware improves very fast, providing powerful electronics and low-cost architectures due to its standardisation and use for many purposes. Therefore, one of the objectives of the project was to develop a system using standard hardware where possible, which is the basis of a low-cost architecture, trying to meet the requirements of the system, mainly in speed and accuracy of measurements. The result of this work has been a system that is able to control up to (but not limited to) 10 conveyor belts, classifying fruits according to their weight, size

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and color, and distributing the fruits in different outputs at a maximum speed of 15 fruits per second per belt approximately.

II. Problem Statement

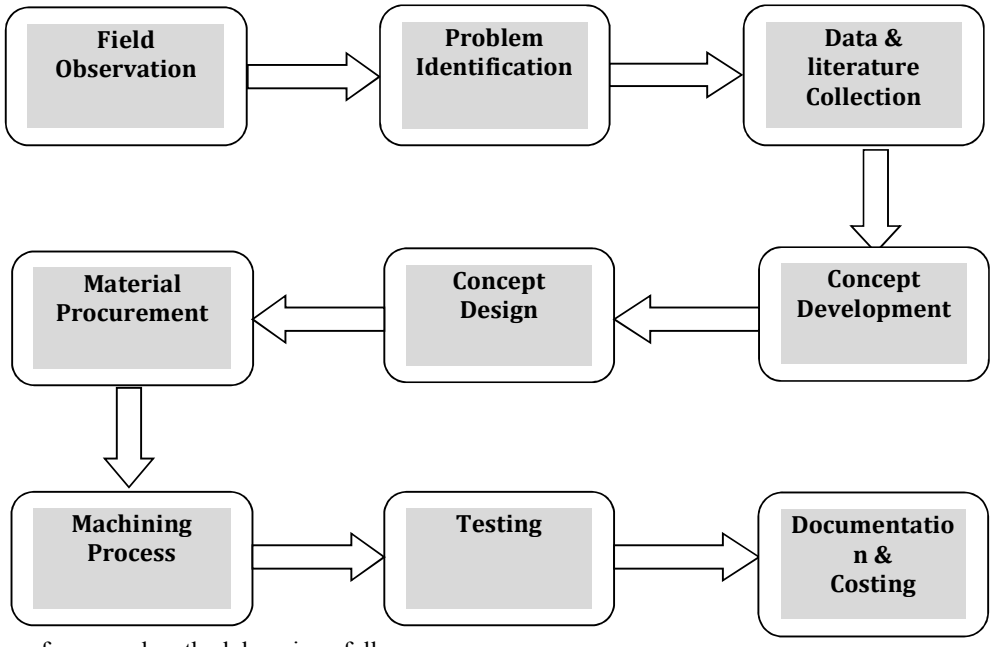
It is observed that lot of time, effort of man power & cost is required during grading or shorting of fruits & vegetable starting from farm to market. Our aim of the project is to make a low-cost machine which will overcome all the problems in manual grading and make a less costly machine then automatic heavy machine. The statement of project is "design & fabrication of Fruits & vegetable grading machine." for used separation & grading of Fruits & vegetable.

III. Objectives

1. To reduce the power consumption during Fruits & vegetable grading.
2. To maintain the accuracy in Fruits & vegetable grading.
3. To develop automation unit, so that m/c can easily be adopted in today's automated Fruits & vegetable grading plants.
4. This type of m/c provides work practically at low cost, low maintenance, low capital investment in less space.
5. To perform the most rigid operation with high-speed Fruits & vegetable grading

IV. Methodology

The below flow chart shows the sequential operation/steps that will be performed during the project process. In this chapter introduction of the project as well as the problem definition are discussed. To solve all the problems discussed above we are producing a new machine, as our project under this topic in our academic year 2021 - 2022, we are preparing a working scale model of this machine. We have proposed a methodology to solve the problems. Our methodology is divided in different parts, under different titles.



Sequence of proposed methodology is as follows –

1. Basic Information & Literature survey.
2. Design of Machine Components.
3. Selection of Components for Machine.
4. CAD modelling & Fabrication of Machine parts.
5. Assembly, Testing & Documentation of Machine.

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V. CONCLUSION

While concluding this report on fruits & vegetable shorting machine, we feel quite fulfil in having completed the project assignment well on time, we had enormous practical experience on fulfilment of the manufacturing schedules of the working project fruits & vegetable shorting machine model. We are therefore, happy to state that the in calculation of mechanical aptitude proved to be a very useful purpose. Although the design criterions imposed challenging problems which, however were overcome by us due to availability of good reference books. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of balancing problem. Needless to emphasis here that we had lift no stone unturned in our potential efforts during machining, fabrication and assembly work of the project model to our entire satisfaction to solve the problem in field for social welfare.

Hence, we selected this project to contribute for sustainable machine. This work presents a new technique for sorting and grading of fruits using pure mechanical approach. This technique begins with shorting the fruits using regular size & grade. The features are efficiently extracted from the mechanical arrangements. The size of the fruit determines its class and fruit's grade is determined. The conveyer & spiral screw technique is used for both classification and grading of fruits, as it also involves handling by humans. The proposed technique accurately classifies and grades the fruits. The results are good for the five chosen fruits of same sizes. This kind of system can be employed in Agriculture Produce Marketing Corporation, etc.

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