FAKULTI TEKNOLOGI MAKLUMAT DAN KOMUNIKASI

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WORKSHOP 2 (BITU 3923)

BITI

PROGRESS REPORT III

PROJECT TITLE:

Automated Crop Harvester

GROUP NUMBER:

Group 7

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CHAPTER VI

TESTING

6.1 Testing Method

Several test will undergo to test the performance of the Automated Crops Harvester to check whether it fullfill the requirement specifications. The testing modules will cover color testing and motor movement. The results obtained from the robot testing will compare with the actual requirements.

In this project, three type of testing will be undergo. Unit Testing, Integration Testing and Repetitive Test will be carried out. These testing helps in identify system bug and robot limitation when it is performing. Testing data and results are collected to make sure developers have enough informations and evidence to make improvement and error correction.

i. Unit Testing

Each and every part of the program is tested to ensure that every components functioning well and fulfill the project requirement. In this project, Unit Testing is run on the embedded image, image detection, image training model and motor movement. The image embedded is tested in the program to make sure that the image specifications such as shape, color, size, etc are correct. The image is then trained with image processing model.

Besides that, several motor such as medium motor from EV3 Lego Set and large motor and servo motor from Tetrix Component Set is tested to ensure that it performing well according to the program. We have to make sure that all motors can move forwards and backwards.

ii. Integration Testing

To carry out Integration Testing, various part are combined and run as an independent project. This testing can ensure that the project can run smoothly and functioning well. The system containing image processing program is integrated with the EV3 brick. The system is connected to the EV3 brick using LeJos Software and to detect tomatoes. The detected tomato is then tested if it can be recognized correctly.

iii. Repetitive Testing

To ensure the accuracy and correctness of the data, the testing are carried out multiple times from different aspects.

6.2 Test Result Analysis for Unit Testing

a. Image Processing

	First Test	Second Test	Third Test	Fourth Test	Fifth Test
Ripe	False	True (56.4%)	True (56.4%)	True (91.9%)	True (88.3%)
Unripe	True (62.1%)	True (73.0%)	True (56.4%)	True (75.4%)	True (86.0%)

6.3 Robot Constraint

i. Image Processing

In implementing the tomato identifier, we build the model by applying a technique called transfer learning. We sampled 100 images of ripe tomatoes and 100 images of unripe green tomatoes and retrain the model. The accuracy of the image processing is the concern. Improvement still can be made to get a higher confidence level and better performance for the face recognition to work accordingly.

6.4 Summary

In conclusion, all the coding, motor movement and other robot components that are used to build our Automated Crops Harvester are successfully tested. All the required functions and specifications of the project are fulfilled. However, we found that there are several limitations for robot functions according to the system constraints. These limitations absolutely will affect the performance and the functionality of the robot. Moreover, these restrictions will cause the result of our Automated Crops Harvester not ideal enough.

CHAPTER VII

CONCLUSION

7.1 Robot Advantages and Commercial Values

Automated Crop Harvester will bring huge benefits in agriculture industrial area. First of all, the implemented intelligent system uses image processing technique to detect and identify the ripe tomatoes then pick up from the plant and this will reduce the burden of the tomato harvester. It is suitable especially for individuals farmers who are aware of and have great concern about tomato harvesting.

7.2 Robot Weakness

In our project, the drawback of the Automated Crop Harvester is the image processing accuracy. The limited materials and sensors may affect the accuracy of the image recognition system and the smoothness of the motor movement. Due to EV3 Lego Set and Tetrix Set is used to build the robot, it have certain factors that leads to

the limitations of our Automated Crops Harvester. As tomato weight is not one of the factor that we are considering, thus we use toy tomato which are lighter than the real tomato for testing. Weakness does not mean it is bad, but it indicates that there is improvement and learning space for the system.

7.3 Suggestion for Robot Improvement

The weaknesses of the Autonomated Crop Harvester could be overcome by having a better training model for image processing. The hardware used could also be improved by using a better version hardware equipped. This could ensure the system could be functioning smoothly and accurately.

7.4 Summary

As the conclusion, Automated Crop Harvester is generally an intelligent system for reducing the burden of tomato harvester if the harvester use this project to pick ripe tomatoes from the plant. The system only able to pick up tomatoes that is totally turn in red colour via image recognition using camera. It does have a great methodology to make an intelligent and smart crop harvester robot.

The system that has been developed will provides benefits to our country at which besides improving robotic methods, it also contributes for creating a new environment using robotics industry. The system still need to be improve with better software and hardware for higher accuracy, effectiveness and performance of the system.

Last but not least, the development of this whole project also able to increase our skills in performing brainstorming, leadership and task arrangement with team member contributions. The knowledge gains from the lectures and theory can be practically uses for this project and sharpen our skills and expertise.