FORMAT FOR STUDENT PROJECT PROPOSAL FOR THE

44th SERIES OF STUDENT PROJECT PROGRAMME

(Hand written proposals will not be accepted, please fill all the details in this MS word file as per the following format. Kindly take a photocopy of the completely filled project proposal and Demand Draft for filling up the Google Forms.)

1.	**Name of the College :** **ACHARYA INSTITUTE OF TECHNOLOGY, BANGALORE - 560107**
2.	**Project Title :** **CROP WEED DETECTION USING IMAGE PROCESSING & DEEP LEARNING**
3.	**Branch :** **ELECTRONICS AND COMMUNICATION**
4.	**Theme (as per KSCST poster) :** **AUTOMATION OR NEW CONCEPTS IN AGRICULTURE** **(cultivation, raising crops, irrigation etc.)**

5.	**Name of project guide :**
	
	1. **Name:** **Mr. SANDEEP KUMAR K**
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	2. **Name:** **Dr. RAJESWARI**
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	   Contact No. : **+91 9449827287**

6.	**Name of Team Members (Strictly not more than four students in a batch):** *(Type names in Capital Letters as provided in your college)* (Please paste the latest passport size photograph adjacent to your respective names) **Name:** **AAYUSHI SHARAN** **USN No.:** **1AY17EC001** **Email id:** **aayushi.17.beec@acharya.ac.in** **Mobile No:** **+91 9109374471** **Name:** **JANANI B** **USN No.:** **1AY17EC030** **Email id:** **jananib.17.beec@acharya.ac.in** **Mobile No.:** **+91 9482303005** **Name:** **KUSHAGRA TANDON** **USN No.:** **1AY17EC038** **Email id:** **kushagra.17.beec@acharya.ac.in** **Mobile No.:** **+91 9415115681** **Name:** **MOHAMMAD PARVEZ R S** **USN No.:** **1AY17EC046** **Email id:** **mohammed.17.beec@acharya.ac.in** **Mobile No.:** **+91 9731844759**
7.	**Team Leader of the Project :** **Name:** **JANANI B** **USN No.:** **1AY17EC030** **Email id:** **jananib.17.beec@acharya.ac.in** **Mobile No.:** **+91 9482303005**

| 8.	**Processing Fee Details (Demand Draft should be drawn from Canara Bank / State Bank of India only):** (processing fee of Rs. 1000/- drawn in favor of Secretary, KSCST, Bangalore – 12) **Demand Draft No. : 162759** **Date : 01-02-2021** **Bank name : Canara Bank** **Note :** Please write Team leader name, Contact No., Project Title and Name of the College on the backside of the DD.
9.	**Date of commencement of the Project : 01.09.2020**
10.	**Probable date of completion of the project : 30.04.2021**
11.	**Scope / Objectives of the project :** The undesirable plants that grow along with the crops are called weeds. These weeds feed on the nutrients provided to the crops and thus reduce the supply of nutrients to the crops, hindering their growth. Hence, "Weeding" is required to be carried out to enhance the growth of crops. Few important weeding methods practiced include using weedicides, tilling before sowing crops, manually pulling out weeds, or using a trowel. Automating Weed detection and destruction can overcome this problem. Our project divulges the idea of developing a weed detection mechanism that can be non-specific to a crop variety detecting different classes of weeds, and deploying it on a tractor as attachments which will spray weedicides on the accurate position. Objectives: • Creating a Weed Image Dataset • Developing an efficient algorithm to detect the existence of different classes of weeds, non-specific to a particular crop • Designing a mechanism to spray weedicide if weeds are detected, all of which will be attached to the tractor

| 12. | **Methodology :**
The proposed solution is to develop a weed detection model that will be non-specific to a crop variety, detecting wide varieties of weeds and deploying it on a processor which will be mounted on the tractor along with the camera modules and shaft mechanism that spray weedicides accurately.

The solution takes the following steps (*Figure 1*):

Selection and Creating the Dataset

- To initially train the model to detect weed from a crop, DeepWeedX dataset will be used which has 17,508 unique 256x256 colour images in 9 classes
- After successful results for the above, the model will be trained on our new Dataset which will be designed to result in maximum accuracy
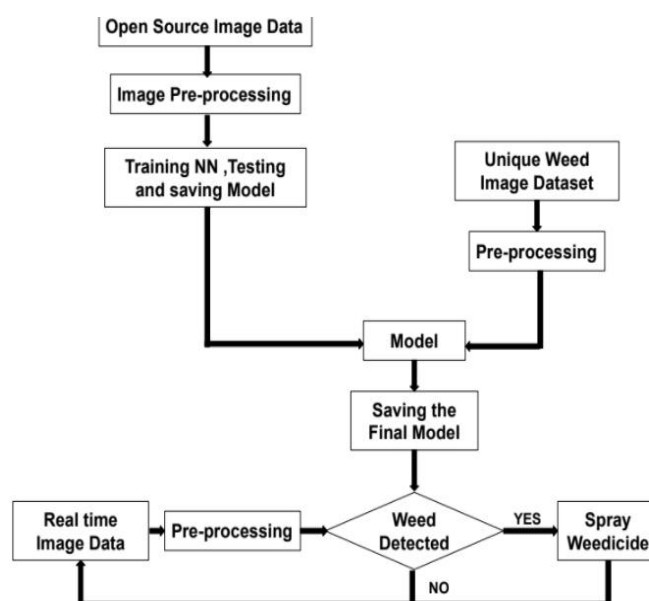
Figure 1: Flowchart of the Weed detection Model

Pre-Image Processing

- For the different images that we are taking from the dataset, we have to pre-process those images using Image-Data Generator features like (horizontal flip, vertical flip, grayscaling the image, etc). Other Pre- |

processing techniques will also be used for increasing the accuracy of the model

- Further, all those images should be divided into training and testing (80% for training, 10% for testing and 10% validation)

Training The Model

- After Image Processing is done, the images are to be provided to MobileNetV2/ ResNet50 architecture, to train the model and their weights will be updated and saved. Also, tweaking is done on the model for better accuracy and to see the variation of the result on the dataset

Validation And Saving The Model

- After the model is made and training is done, the model config can be saved as a .h5 file which can later be used to predict the model when subjected to a new image

Finalizing The Model

- For Finalizing the model, A Flask API for the model can be made which can be used easily on local host or server

The portable weed detection and spraying entity can be fitted on the Tractor at five contact points as shown in the figure. The 8MP camera situated at the front end of the tractor captures the real time video and the video is processed to give the model as images (with the frame rate to be set upon prototype testing). Image pre-processing of the captured image is performed, and then is used by the model to predict whether the weed is detected or not. If weeds are detected in that particular area in trial, the processor decides to spray the weedicide.

The spray mechanism is situated at 5 positions (Figure 2) with the distance between it and the camera calculated on prototype testing. This distance depends

upon the time complexity of the model and the speed of the tractor. The cameras are tilted around 30"- 45" and the spray mechanism is at 90" with respect to the principal axis of the shaft contacts. The Image captured by the camera (wide angle) will be divided into 5 parts and processed simultaneously with Time division multiplexing. The results of the 5 areas are sent to the 5 contact points to spray weedicide if weeds are detected. Weedicides are filled only in the central weed storage unit which is placed on a surface at a higher level than the 5 contact points (Figure 3) to avoid energy requirement for pumping up the liquid otherwise.
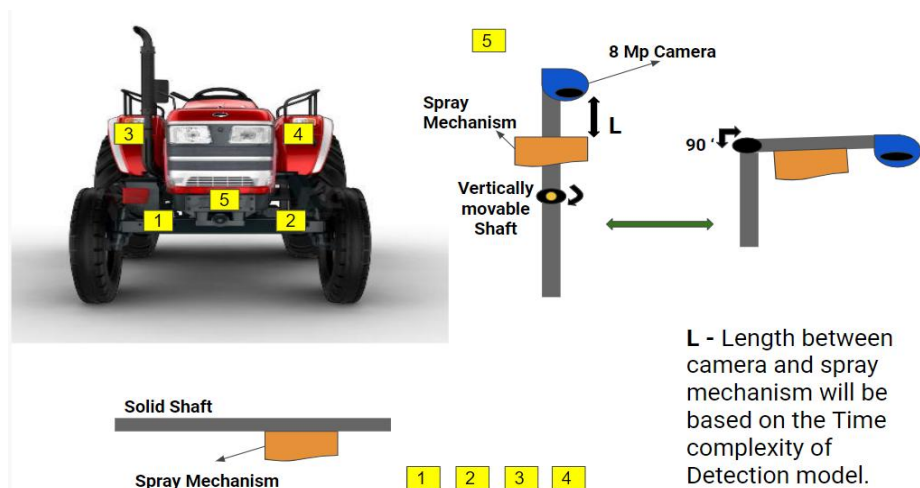
Figure 2 : Front-view of the tractor showing attachments

Figure 3 : Side-view of the tractor showing attachments

13.	**Expected Outcome of the project :** The portable weed detection and destruction entity can be fixed on the front and side ends of the tractor where the camera captures the real time video and the processor decides whether or not the weedicide is to be sprayed depending on the output of the neural network. The product package, hence is highly cost effective and can be easily afforded by the farmers and customized fitting service shall be provided according to the tractor variations. ● Short Term Outcome - Reduction in tedious labour involved in weeding ● Medium Term Outcome – Cut down in expenditure on farming (water, manure, etc.,) as only cultivated crops are at the receiving end of the supplies ● Long Term Outcomes - Enhancement in the growth of the cultivated plant, resulting in healthier yields, Increase in farmer's Return on Investment Farmers spending round the clock time and energy in order to get rid of the weeds, without harming the cultivated crops are the target for the innovation. Also, AI enabled agricultural processes will encourage the youth to participate in bringing agriculture and its innovations to the frontline.
14.	**Is the project proposed relevant to the Industry / Society or Institution? :** **Yes / No : Yes** **Institute Name: Indian Institute of Horticultural Research, Hesargatta** **Indian Institute of Horticultural Research will be extending their support to collect data set required for the project from their premises, and guide in labelling the collected data.** **Contact details: Mr S S Hebbar (94491 05802), ICAR** **If Yes, Please provide details of the Industry / institution and contact details :** (**Note:** Preference will be given to those projects relevant to the industry / institution. Hence, be specific in giving detailed information). Is the industry extending support - technology / funds / use the final product, please specify.

15.	**Can the product or process developed in the project be taken up for filing a Patent?** **Yes / No :** No **Prior Art search done?** **Yes/No : No** **Note:** If Yes, you may contact Patent Information Centre of KSCST for more details Email : patent@kscst.iisc.ernet.in
16.	**Budget details (break-up details should be given) :** Note : KSCST will provide nominal grant support for carrying out the project by students if selected by the project selection committee.

Budget	Amount
a) Materials / Consumables	15,000.00
b) Labor	2,000.00
c) Travel	1,000.00
d) Report	500.00
e) Miscellaneous	1,500.00
Total	20,000.00

17.	**Any other technical details (Please specify):** The Machine Learning Model is trained with help of Transfer Learning Model that is inherited inside Tensor-Flow 2.O Library. The model weights will be converted to TensorFlow-Lite Model weights so that small scale and low power system can run Weed-Detection ML Model. Further, the model will be trained on Nvidia Tesla P100 based AI/Deep learning Server, and tested on Raspberry Pi.
18.	**SPP Coordinator (Identified by the college) :** **Note:** To be identified by the principal of the institution. The project proposals must be submitted to KSCST through SPP coordinator designated by the Principal. **Name : Mrs. Prof. Chayapathi A R** **Email id :** chayapathiar@acharya.ac.in **Contact No. :** 9986049191

(Name & Signature of Project Guide with Seal)   **(Name & Signature of HOD with Seal)**

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DECLARATION

(From Project Students)

We, the project team hereby declare that the details enclosed in the project proposal are true and correct to the best of our knowledge and belief and we undertake to inform KSCST of any changes therein in the project title, students name will be intimated immediately. In case any of the above information is found to be false or untrue or misleading, we are aware that we may be held liable for it. We hereby authorize sharing of the project information with this project proposal with the Karnataka State Council for Science and Technology, Bangalore.

We are aware that the project team has to exhibit / demonstrate the project in the nodal centre and interact regarding the project with the experts and to exhibit the project in the State Level Seminar and Exhibition (if selected). If the student team fails to attend the evaluation in nodal centre or fails to attend the State Level Seminar and Exhibition, the supported project amount will be returned back to KSCST.

We also hereby, enclose the endorsement form to KSCST, Bengaluru.

Name of the students   **Signature with date**

1. **AAYUSHI SHARAN**

2. **JANANI B**

3. **KUSHAGRA TANDON**

4. **MOHAMMAD PARVEZ R S**

ENDORSEMENT

(From College, endorsement to be taken in the institution / Department Letter head)

This is to certify that 1) **Ms. AAYUSHI SHARAN**, 2) **Ms. JANANI B**, 3) **Mr. KUSHAGRA TANDON**, 4) **Mr. MOHAMMAD PARVEZ R S** are bonafide students of **Department of Electronics and Communication**, in the degree program of our institution. If the project proposal submitted by these students under the 44th series of Student Project Programme is selected by KSCST, we will provide the requisite laboratory / Computer / infrastructure support in our college / Institution. Further we also take necessary steps to see that the project team will exhibit / demonstrate their project in the nodal centre and in the State Level Seminar and Exhibition (if selected). If the student team fails to send the completed project report or fails to attend the evaluation in nodal centre or fails to attend the State Level Seminar and Exhibition, the supported project amount will be returned back to KSCST.

(Name & Signature of Project Guide with Seal)

(Signature of HOD with Seal)

(Signature of the Principal with Seal)

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