

Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

Title of Project: Allotment Garden Pest Control
Group Name: Allotment Garden Pest Control
Group Members: 1) Chua Yu Chen 2) Lee Yi Xuan 3) Caleb Cherng Kai Zhe

1. Problem Finding

1 A Document a list of problems you have identified. Your documentation should show clearly how your group came up with the problems.

Before coming up with problems to solve, we decided on our target audience. Our main target audience are the allotment garden users. We chose them as there are very few inventions targeting allotment garden users as it is a relatively new concept established in Singapore. After doing surveys and interviews, we identified several problems allotment garden users faced. The two main problems garden users faced were pests destroying crops and watering of plants. (Survey pictures attached at the bottom)

1 B You should have selected a problem based on some considerations. Identify and justify these considerations.

We decided to tackle the issue of birds destroying fruit crops. People practice organic farming in allotment gardens. Birds and insects are common pests which allotment garden users hardly have protection against. Allotment gardens are located in open air areas, leaving it vulnerable to pests. The allotment gardens also have a very small land space, in which large scale garden protection tools cannot be utilised. Hence, we decided to solve the issue of pest birds.

1 C List some problems your group would like to solve. List also the considerations for selection of problem in the evaluation grid below. Score the considerations, against the problems, with points 1 (least significant) to 4 (most significant). Sum up the total points for each problem. Identify that problem you would like to solve.

Problem Evaluation Grid

*add more columns and rows where necessary

Considerations for Selection	Problems		
	#1 Pest birds	#2 Insects	#3 Hassle to water crops
Feasibility	4	2	3
Creativity	3	4	2
Difficulty	3	1	2
Total	10	7	7

2. Define the Problem

2 A Extent of problem (Research and discuss the problem and write down the problem statement)

“Birds are a major cause of damage to crops, especially rice and fruit crops” (Nakamura, 1999)

Birds have been a great problem to farmers in all sorts of gardens. Since allotment gardens are fully vulnerable and exposed to all sorts of birds, this is an issue that is required to be addressed and prevented. Hence we decided to solve the problem of birds destroying fruit crops in allotment gardens.

2 B Compare and contrast the existing or similar solutions.

Existing Solutions	How it works	Problems
Scarecrows	Scarecrows are placed near crops in order to trick birds into thinking that there is a person there in order to scare them away.	Scarecrows have to be moved overtime as the birds may no longer see it as a threat as time passes.
Scarecrow water repeller	It has the same concept as a scarecrow except that it has a sensor that detects birds and shoots strong bursts of water towards them.	This may cause disturbance to the other allotment garden owners as the water may make the floor wet or wet other people who are in the garden as allotment gardens are only small plots of land.
Electronic sound makers	Sensors are used to detect birds and a loud noise would be played in order to scare away the birds.	The sound that is produced by the electronic sound makers causes a huge disturbance to people at the garden.

3. Your BIG IDEA

3 A Describe your proposed invention.

We will create a Scarecrow which moves when it detects birds so as to scare the birds away.

“The researchers tested how jackdaws responded to moving birds, moving snakes and moving sticks -- and found they were most cautious of the moving sticks.” (University of Exeter, 2018)

Using Passive Infrared Sensors which are able to detect motion based on change of infrared radiation in its field of view, we are able to utilise this sensor to detect birds. Birds are also startled by sudden motion, which allows us to scare the birds just by utilising a D.C. motor which provides a sudden moving mechanism.

3 B Explain the purpose of your proposed invention and the potential benefits to users.

The purpose of our invention is to scare birds away. Our invention has a small area of effect. However, it is sufficient to protect each individual garden plot. This means that our invention would not tamper with other garden plots and not trouble or disturb any garden users in any way. Our invention also incorporates the use of solar panels, which allows the batteries of the circuit to constantly be charged so that the circuit can be of prolonged used outdoors which negates the trouble of constantly replacing batteries.

3 C In what ways would your proposed invention be different and/or better than existing solutions, if any?

Our project is different from other solutions because it protects small pieces of land and causes no disturbance to other users in allotment gardens, this makes our solution the only feasible one in this particular context.

3 D What are some problems you expect in the course of your proposed invention?

The main expected problem is to learn how to code using Arduino. To utilise a Passive Infrared Sensor in a relay system, we would have to utilise Arduino programming. Learning Arduino itself would take quite some time. Besides that, we have to start from the basics and learn to make beginner projects before embarking on this project.

Finding ways to test our prototype is also another expected problem. There are limited allotment gardens users in Singapore as it is a relatively new concept and we are diving into this as we see this as a promising project to be developed on. Despite this being an opportunity, the limited allotment gardens in Singapore limits our chances of being able to test out our prototype.

3 E What and when are the major milestone (project timeline) in your invention?

March - Learn Arduino Programming and constructing of electrical circuits

June - Completion of first prototype

July - Completion of Second prototype

August - Completion of Final prototype

4. Construction or Modelling Process

4 A Explain how and why the materials were chosen for the prototype/ product of your invention

Mosfet is chosen as it is able to act as a relay system and functions as a switch. Our circuit is relatively simple so a Mosfet was chosen over a relay. Wires, breadboards, motors and jumper wires are necessary in making a circuit and therefore used in our invention. Plastic casing is used as it is waterproof and it can protect the prototype from the rain. PIR sensor was used as it is the only type of sensor that is suitable for our invention. Solar panels and its controller are chosen as it can charge the batteries we use so as to ensure our invention will never run out of battery.

4 B Explore these considerations that may guide the construction of your prototype/ product.

The materials that are used for our product needs to be able to withstand against various weather conditions as it is made to be placed in the outdoors and that it needs to protect the electrical components from the rain.

The materials used should not be so costly as this product is supposed to cost less than other products and should be easily available to the public.

4 C Document the prototype/ product development stages. You may use drawings, photographs or videos.

(Photographs are attached at the bottom)

5. Modification and Evaluation

Upon the completion of your prototype/ product, you would need to see if it is working the way you want it to work. Check if your product has met the identified purpose and the user's need; and implement necessary modifications and improvements. This process may take several rounds.

5 A Write down your prototype/ product test criteria and check against it if it works. Identify areas of weakness for modification. Indicate the test iteration and date of test.

Test Iteration: 3.0	Tick			Remarks
Test Date: 26/7/19	Pass	Fail	Potential Failure	
Ability to scare away birds	X			Birds were scared away when motor spins
Pose no disturbance	X			Poses no disturbance
Ability to protect crops	X			Little crop damage
Were the solar panels able to charge the battery?	X			Batteries can be charged by solar panels from 10am to 4pm
Will the battery charge to full in a day?	X			Batteries can be charged, takes 6 hours a day

*Add more rows for more criteria

** Repeat table for next test iteration

6. References

Read <http://www.bibme.org/citation-guide/apa/> on how to cite references.

6 A Cite the references you have used for your project work. Your source of reference should come from different types (eg books, magazine, websites, journal articles, interview, photographs, product brochure, reviews etc.)

Crop Depredation by Birds in Deccan Plateau, India (2014). International Journal of Biodiversity. Retrieved from <https://www.hindawi.com/journals/ijbd/2014/947683/>

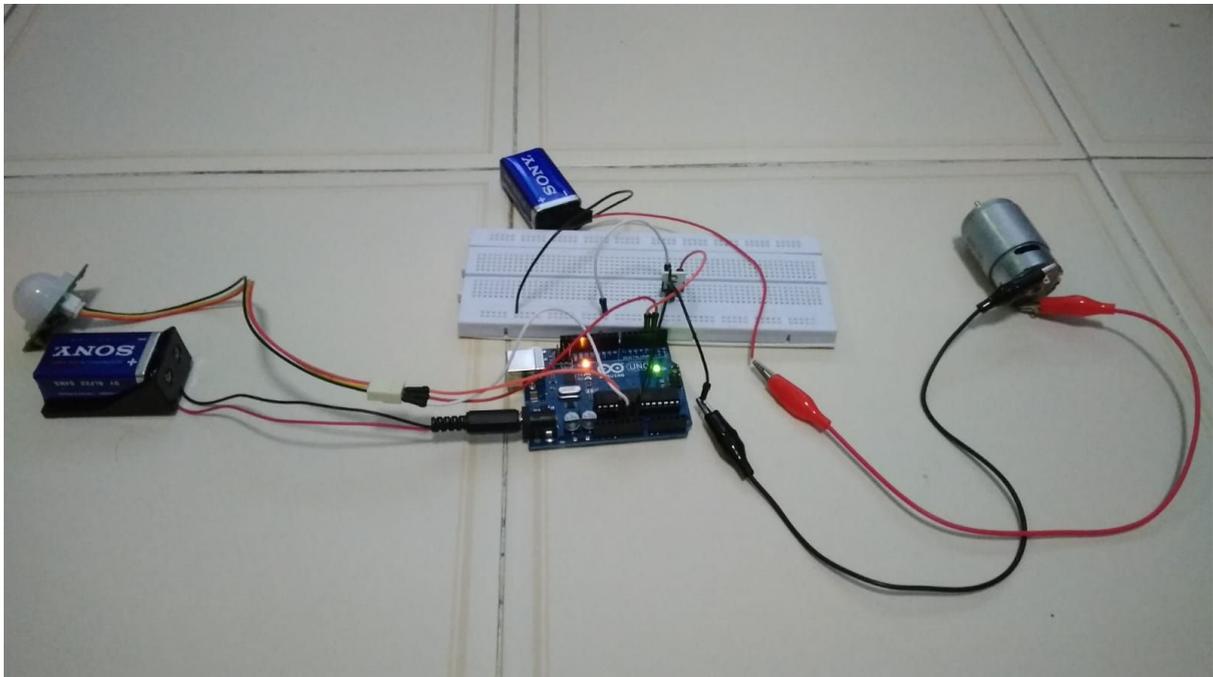
Damage to Crops by Birds (n.d.) Retrieved from <http://www.ffc.agnet.org/library.php?func=view&id=20110718144045>

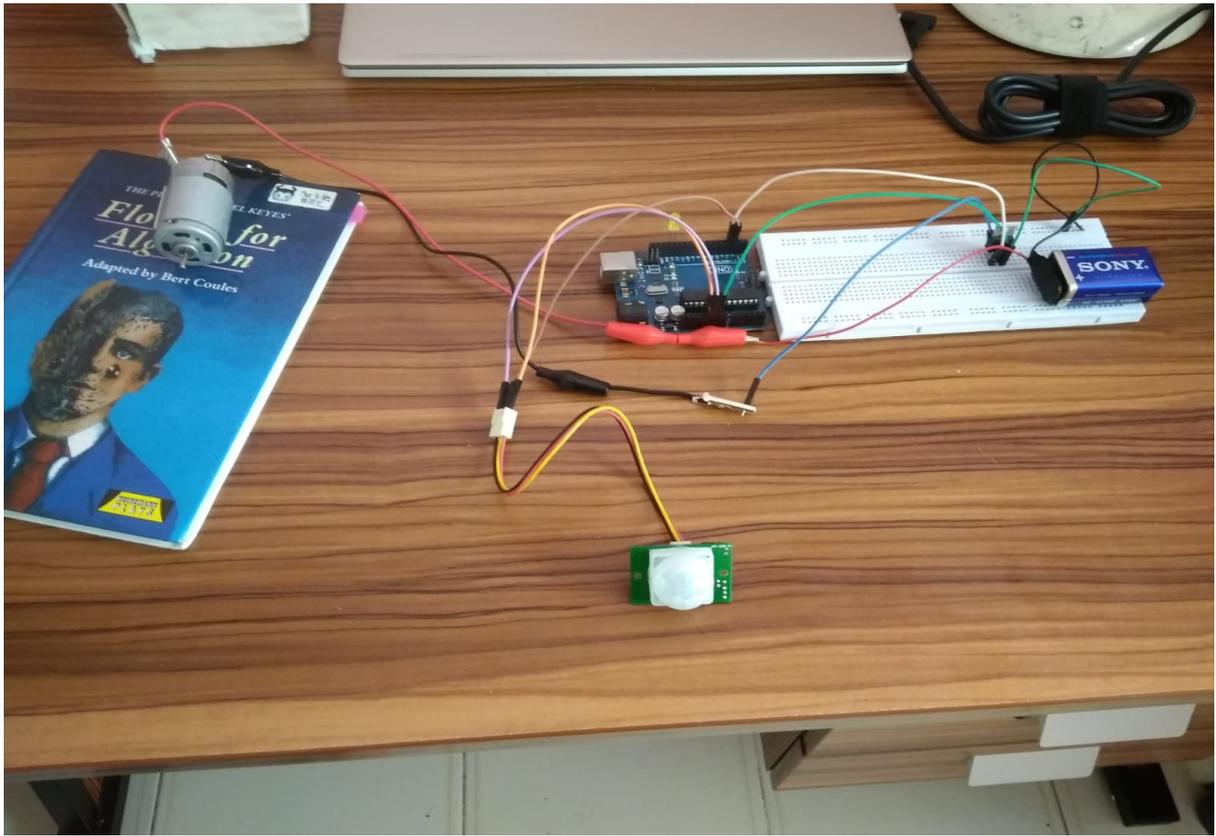
Row Covers for Insect Management (n.d.) Retrieved from <https://entomology.ca.uky.edu/ef322>

How Does a Fake Owl Work to Scare Birds Away? (2019) Retrieved from <https://sciencing.com/owl-work-scare-birds-away-4913851.htm>

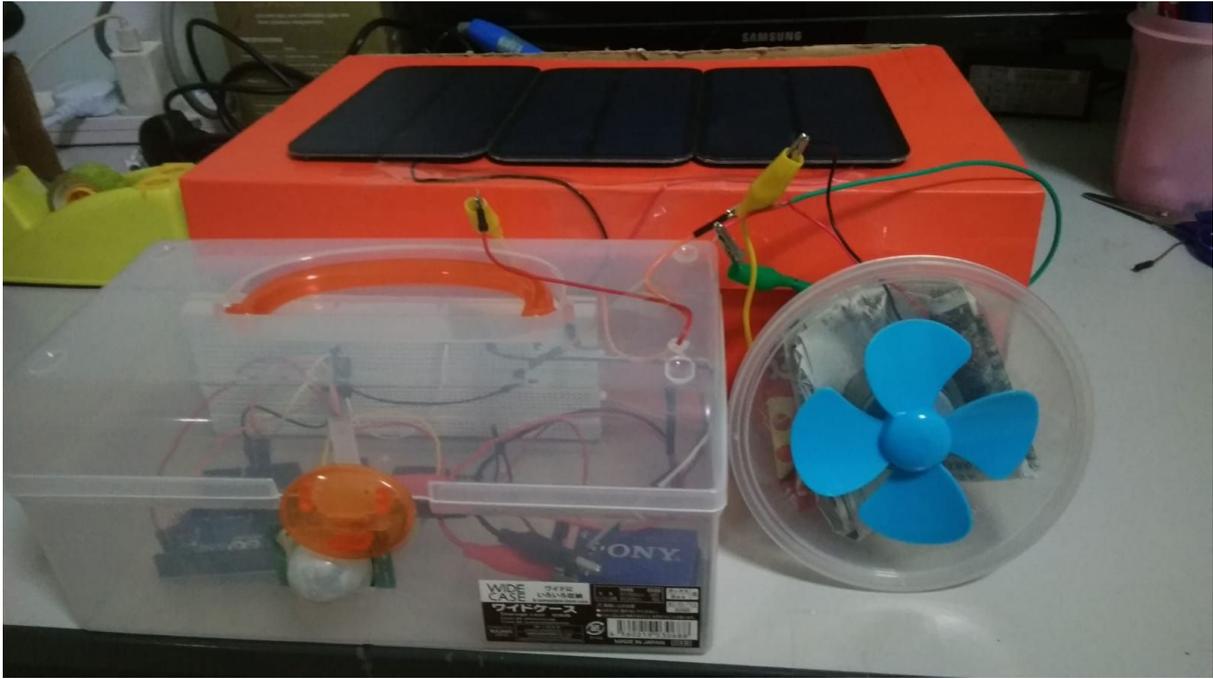
Do Scarecrows Work? (n.d.) Retrieved from <https://www.washingtoncitypaper.com/columns/straight-dope/article/13045970/do-scarecrows-work-the-science-of-keeping-birds-away-from>

Birds startled by moving sticks(2018) Retrieved from <https://www.sciencedaily.com/releases/2018/10/181024083350.htm>





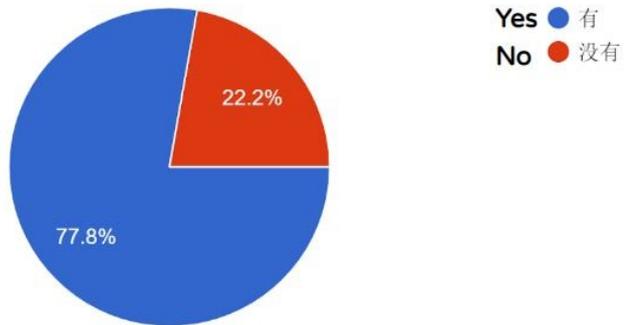




Have your plants in allotment gardens been damaged or eaten by birds or insects before?

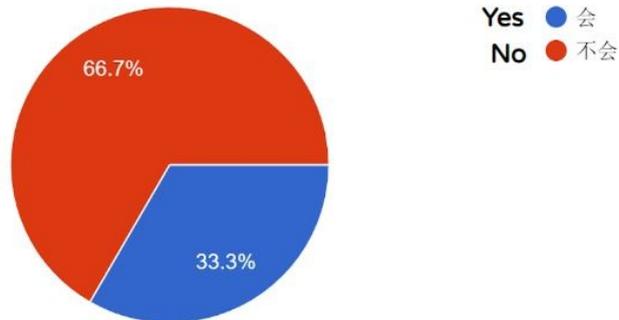
在社区花园里，请问您所种植的植物有...有被任何害虫或鸟儿给吃掉或糟蹋过？

27 responses



Is it a hassle to water plants? 请问您会认为浇花很麻烦吗?

27 responses



您在管理社区花园时，有没有遇到什么困难？

27 responses

What were some difficulties you faced when managing your garden plot?

很花费时间	Time consuming
时常会有鸟儿吃我种的菜	Pest damage
通常会有鸟儿破坏我的植物	Pest damage
鸟儿破坏植物，造成伤害。	Pest damage
许多像是植物被破坏，害虫吃了蔬果等	Pest damage
不方便行动，社区花园里的活动范围太小	Lack of space within garden
没有，因为刚参与这个活动	N.A
会非常不方便，而且通常因鸟儿和昆虫损失很多	Pest damage
有很多困难	Various kinds
会有鸟来吃我的植物	Pest damage
鸟儿在花园里打乱，弄坏植物。	Pest damage
蔬果被害虫吃和被鸟儿打翻	Pest damage