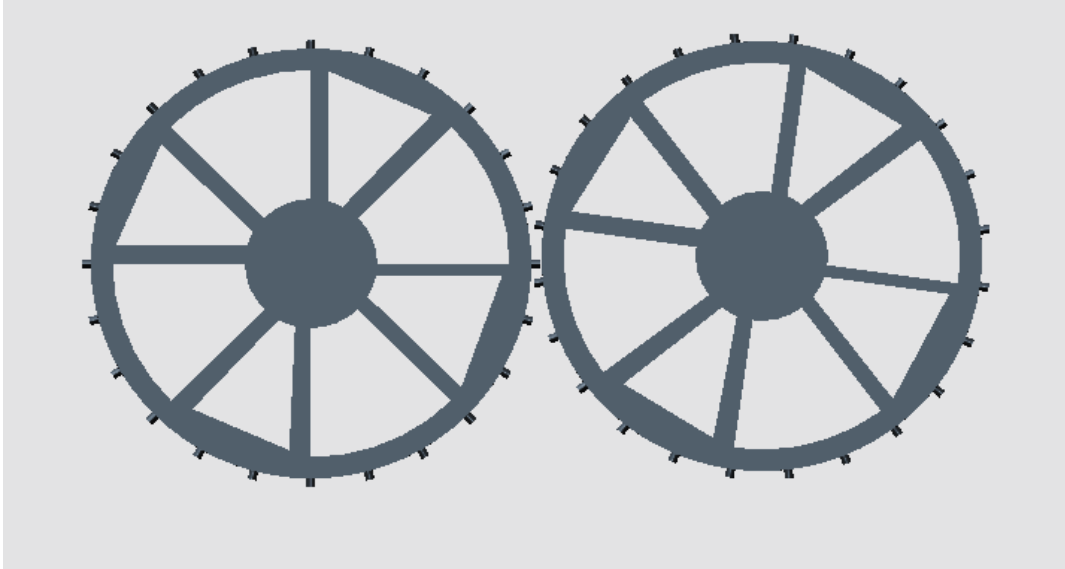


- Describe idea

This design concept was inspired by John Deere's Corn Threshing Machine. The pinch point weed removing mechanism is composed of two wheels with spokes. The outer part of the wheel has small extruded rubber ridges to further capture and pull weeds. The idea is to rotate each wheel upwards in opposite directions as to pull up anything in the midline of this wheel contact. Depending on the final design, the wheels will either be aligned along the line of motion or spin perpendicular to the line of motion. If the first option is decided, one of the wheels will need to be back spun and further considerations will need to be taken to decide on the best method of which this will be done. For the other option, perpendicular motion, we will have to decide the best way to attach this mechanism to the frame of the robot as to minimize the force acting in the opposite direction as much as possible.

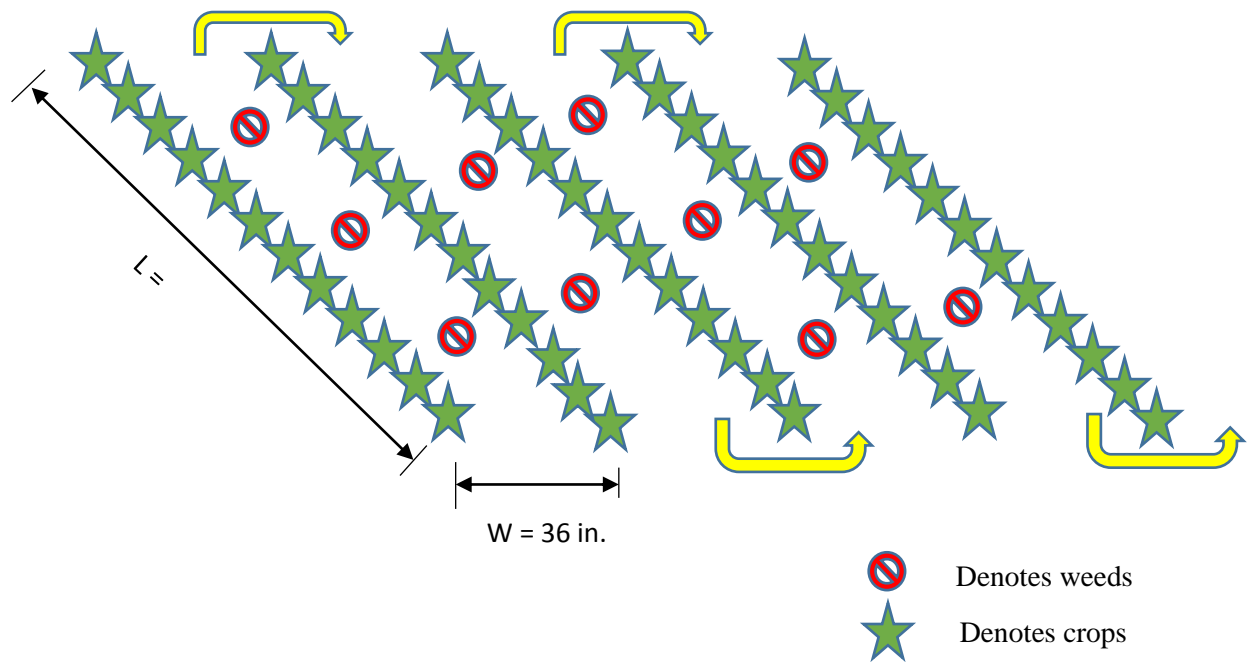
- Mechanical components of the idea
 - Materials:
 - Wheels - The wheel will be made from an aluminum alloy. The proper painting or anodizing procedures or will be carried out to ensure there is no corrosion on any surface.
 - Ridges – These will be made from rubber in order to pull up the weeds. ETHYLENE PROPYLENE RUBBER may be selected for use because of this materials excellent resistance to atmospheric ageing, oxygen and ozone up to about 150C. It has good resistance to most water-based chemicals and to vegetable-based hydraulic oils. Also in consideration is natural rubber. However, while this material would be the most cost efficient, it would not provide the best resistance to oxygen and ozone. Chemical protection could be applied to natural rubber to alleviate these issues but these are details we will have to consider when deciding on the final material.
 - There must be clearance between each wheel as to minimize frictional losses. The length of this clearance will need to be determined based of factors such as dirt effects and average thickness of the weeds that will be pulled.
- Mechanical specifications of the idea
 - The compressibility of the wheels do to normal loading must be considered, assuming the robot will operate 24/7 and that the root of the weeds will apply significant force onto the wheels when being pulled up.
 - Generally speaking, it is safe to assume that our working robot will be operating under high temperature conditions, especially because of the geographical location. With this in mind, sustained loading (creep) tests must be carried out to ensure that the normal loading conditions that will act on the robot will not damage the materials.
 - The size of the wheels will be determined as soon as soil testing is completed and the maximum amount of weight is known. After this, we will be able to specify how big each wheel will be to efficiently pull up weeds.
 - If the wheels are spun too fast, the weeds will slip through the rubber ridges. If the wheels spin too slowly with not enough torque, the wheels will be backdriven and the entire system could be damaged. The optimum speed for which the wheels will spin will need to be determined through extensive prototyping and testing.
- CAD for design



- Manufacturing considerations
 - This design very closely resembles tires with spokes. It is safe to assume there will not be many problems in manufacturing. Additionally, both aluminum and rubber are used on a large scale and are very common materials. Depending on the type of aluminum and rubber used, cost should not be a serious issue.
- Advantages/disadvantages
 - Strengths – Cost efficient, common design, easily manufactured
 - Weaknesses – Could cause significant drag on the entire system, depending on how it is connected to the frame and in what direction the wheels spin.
- Evaluation of designs
 - Why? – This design is desirable because of its simplicity. Instead of using some type of advanced technology to grab the weed and pull it out of the ground, a naturally occurring material would be used that seemingly does the same thing.

[\[1\] http://www.merl-ltd.co.uk/2003_materials/rubber12.shtml](http://www.merl-ltd.co.uk/2003_materials/rubber12.shtml)

PLOT



Under realistic field conditions, the rows of crops will not grow in perfectly straight lines, this must be taken into consideration when the navigation component of the robot is designed.

(I don't really know what else to say for this part. Also, I don't remember the length of the rows.)