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IRRIGATION SPRINKLER ROBOT

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ABSTRACT

The new technologies play a more and more important role in improving the productivity over the agriculture industry. The irrigation machines as well as technologies have significant roles. Nowadays, intelligent systems and robots are employed supplementary on irrigation systems, aiming to decrease the manpower defects as well as save on energy and time. In the present work, the sprinkler irrigation classic method (moving sprinkler) is considered in detail and some of the shortcomings of this method are highlighted. Since, in sprinkler irrigation classic method after each period of irrigation the position of the sprinklers have to be replaced by manpower, this difficulty makes the method impractical from time, cost and energy points of view. The purpose of this study is to propose and develop an automatic guide vehicle (AGV) with the capability to change sprinklers timely and on appropriate positions for sprinkler irrigation classic method. The designed AGV is simulated on computer environment and the results show acceptable outcomes.

Keywords: **Automated guided vehicle, irrigation, agriculture.**

I. INTRODUCTION

The limitation of Water resources and global population growth has led states and governments worldwide to increase agricultural products per area unit and optimize soiland water resources productivity with using new irrigation methods. Developing irrigation methods and their equipment manufacturing technologies, especially those of pressure irrigation system resulted in inventing new approaches to increase irrigation Efficiency. Generally, current irrigations systems are classified into pressure and

gravitational systems; the pressure category includes sprinkler and drip irrigation systems and Gravitational system usually involves furrow irrigation. Thus, choosing each system could maximize water productivity and minimize costs of keeping farms. Considering that most part of Iran lies in desert climate, water is the most important factor in agriculture. Because of the limitation in fresh water resources and fertile lands and the costs of institutions (workforce, energy resources, chemical fertilizers, etc.) which are going to be high, it seems to be necessary employing appropriate methods. Therefore, in order to improve utilization and productivity, it would be possible to optimize economic efficiency through resource management and utilization of water

resources at the minimum level. In comparison with traditional systems, what is expected of automatic irrigation system is decreasing water utilization without diminishing production rate. Although an automatic system could meet the needs without permanent human presence and monitoring during

the growing season, continual presence of the worker to control irrigation automatic instruments is not economic. Through advancements in technology

and advent of processors and controllers, it will be more serious improving the role of farmer as an observer off-field particularly in the light of new irrigation systems.Human errors resulted by operators' mistakes or delays in taking required steps, which leads to reduce productivity. Thus, with waterworks development and various instruments, the under pressure units would be contortion, which are allocated the most bulk of sources. Monitoring and observing meteorological parameters, water hydraulic,

quality features along with central and local precise controlling irrigation instruments, have provided an opportunity to predict and control unusual reaction of installations and also preventing accidents which lead to increasing productivity of per area unit.

II.PROBLEM STATEMENT

Drip irrigation depends on extremely clean water. The tiniest particle of mud sucked up by our creek pump quickly clogged the holes in our irrigation system, which meant that the soil around the clogged holes got no water. If you plan to install drip irrigation with anything except city water, you will need to install a serious filter and change it regularly. Drip irrigation requires a lot of hoses and they have to be moved every year if you practice crop rotation. Drip irrigation is for row crops, not for beds. Drip irrigation is expensive

Fig.Drip Irrigation (Chiraharit Private Ltd.)

III. OBJECTIVE

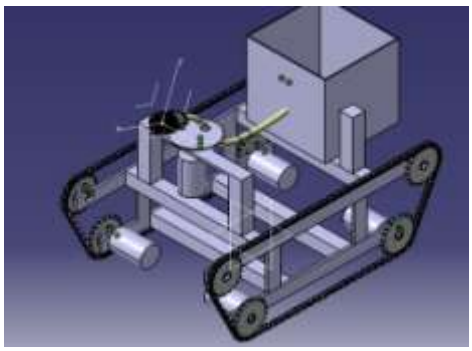
In method irrigation wings fixed but sprinkler are movable. For reducing expenses, big sprinkler is used that numbers of fixed Sprinkler irrigation wings are reduced significantly. This method has easier utilization, lower expense and alternative moving compared with other method. Useful life of equipment and pipes are suitable, if pipes are put inside of earth, there is no danger of theft, and also the long leg plants can be irrigated. Because, there is possibility of installation of long stand for sprinklers, for the sake of these advantages farmers welcome to this method so much and the method has developed in recent years.

In this system of irrigation riser is fixed while sprinklers are connecting on riser during irrigation. Likewise, irrigation riser is separated and transferred to the next one, after each period. The main disadvantage of this

method is that, the pipes are fixed during the irrigation season but irrigation risers are moved by human labor with the sprinkles which are installed on each riser

- Replace human power and removes the drudgery associated with the use of human power.
- It carefully controlled the irrigation process.
- High quality of irrigation is achieved as there is no tradeoff between the time and quality.
- It has also low maintenance cost

IV.CAD MODEL



V. SELECTION OF MATERIAL OF THE COMPONENT

A) Material chassis-

- Aluminium can be severely deformed without failure.
- It can also be cast to a high tolerance.

B) Sprocket- Mild Steel [PHS06B1BS21]

Fig. Spocket(VEX robotics**)**

C) Motor-(30 RPM)

Torque=3.5Nm

Fig.Dc Motor

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D)Chain –Mild steel

Fig.chain mecahnism

VI.CALCULATION

CALCULATIONS FOR MOTOR

- Mass = 10 kg &
  =10*9.81
- Force = 100 N
- Torque = Force * Radius of Sprocket
  = 100 * 35
  = 3500 = 3.5 Nm
- Coefficient of Friction = 0.05 (std. for chain)
  = 3.5 * 0.05
  T = 0.175 Nm
- Power = Force * S
  = 100 * 0.1
  = 10 W
- Motor efficiency = 80%(assume)
- P = 10 / 0.8
  = 12.5 W
- P = 2*3.14*N*T/60*1000
  N = 0.0125*60*1000/2*3.14*3.5
  = 34.1

N = 30 RPM (STD.)

- CALCULATIONS FOR SPROCKET & CHAIN LENGTH –

Q = tan-1 (100 / 100)
= 45

- Length –

L1 = 3.14 (r1 + r2) + 2*x + (r1 – r2)2 / x
= 3.14 (34 + 34) + 2 * 920 + (34 - 34)2 / 920
= 2053.62 mm

VII.TOWARD AN AUTOMATIC GUIDED VEHICLE (AGV) IN SICSMS

The advantages of introducing robots to agricultural sector cannot be overemphasized, to eliminate the disadvantages associated with the use of classic sprinkler system, such as the trade-off between duration and quality of sprinkling, energy sapping on the operators part, the use of robot becomes inevitable. This work emphasizes the application and development of automated guided vehicle (AGV) to replace the classic sprinkler systems. This is based on explanation given in the previous sections about AGV in agriculture and the disadvantages of the SICSMS. The propose system has the capability of taking out the sprinkler from its locations after every sprinkling period and move it to another position for continuous sprinkling, without loss of time. The designed system comprises of two parts, the AGV and the moving path

VIII.RESULT

The AGV equipped SICSMS method shows the following improvements in compare with conventional SICSMS method:

The simulation results show that, the AGV equipped SICSMS method has capability to rich maximum irrigated area. Elimination of the channels for conveyance, therefore no conveyance loss Suitable to all types of soil except heavy clay Suitable for irrigating crops where the plant population per unit area is very high. It is most suitable for oil seeds and other cereal and vegetable crops Water saving Closer control of water application convenient for giving light and frequent irrigation and higher water application efficiency

IX.FUTURE SCOPE

IRRIGATION SPRINKLER ROBOT is designed and built according to design criteria and open field tests are conducted. The cheap cost of robot is another great advantage and it would reduce the investment costs of farmers. The robot can be further developed with advance technology to alert farmers in case of emergencies through messages to their mobile phones. This proposed prototype of robot can be made effective and efficient

by using renewable energy to power up the robot. Solar panels can also be incorporated in this system. IRRIGATION SPRINKLER ROBOT promises a future with newer hopes and great potential.

X.CONCLUSIONS

The research is started with an over view about irrigation and its related methods, two category of irrigation has been explained briefly. The first category includes some traditional methods and the second one includes modern methods. One of the modern methods which are covered in this work is SICSMS method. By utilizing SICSMS method some problems encountered such as moving the sprinkles with human labor, labor should move the sprinklers after irrigation period. An AGV has been developed and simulated, which is able to move during a rail way. Aiming to travel on this rail can detect the available irrigation in its path and remove them to their new place. The comparison between the conventional SICSMS method and AGV equipped SICSMS method highlighted that the maximum under cultivation surface is reachable by AGV equipped SICSMS method**.**

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