SIX LEGGED SEMI-AUOMATIC MACHINE FOR AGRICULTURAL SEEDING AND SPRAYING

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ABSTRACT - In this paper current state of many walking robots are compared and advantages of a legged systems against wheeled robots are described. In the subject of our research we have selected a six legged robot which is biologically inspired by insects. We are focusing mainly on locomotion on uneven terrain using opposite gait of locomotion. The six legged robot has been designed to navigate smooth and irregular terrain. The stabilization of legs is inspired by biomimetic stepping leg transferences with an active balance control so as to reduce the propagation of instability while performing rapid stepping actions for a fast walking gait. Robotics has borrowed from nature with varying degrees of abstraction, from physical appearance to observed behaviours. This paper describes the proposed design and construction for the six legged normally called as hexapod robot to navigate on the uneven terrain. This robot is mainly used in agricultural purposes which can seed and spray the water automatically.

Key words – six legged robots, irregular terrain, active balance control, agricultural purposes

1.INTRODUCTION:

The hexapod is an insect inspired robot which has six legs that enables to move flexibly on various terrains. The main advantage of this type of robot is its stability. The nature inspired the researchers and new innovative ideas come in mind but sometimes they are simple and effective, sometimes cumbersome and critical. One of the first walking machines was developed in about 1870 by Russian Mathematician Chebyshev. This walking machine had four legs arranged into pairs. Legged machine has been used for at least a hundred years and are superior to wheels in some aspects. Legged locomotion should be mechanically superior to wheel or to tracked locomotion over a variety of soil conditions and certainly superior for crossing obstacles.US army investigation reports that about half the earth surface is inaccessible to wheeled tracked vehicles, whereas this terrain is mostly exploited by legged animals. Wheeled robots are the simplest and cheapest also tracked robots are very good for moving, but not over almost all kinds of terrain. There are different types of legged walking robots. They are roughly divided into groups according to the number of legs they possess.

Bipeds' robots are dynamically stable, but statically unstable, such robots are harder to balance, and dynamic balance can only be achieved during walking. Hexapods are six legged robots, on the other hand, have advantages of being statically stable. During walking they can move three legs at a time, thus leaving three other legs always on the ground forming a triangle. Previous work proved the feasibility of fabricating a crawling insect scale

robot capable of forward locomotion on flat ground, and the results motivated multiple improvements in design.

The hexapod provides additional degrees of freedom for the robot's censors and on board equipment. Some general purpose robots were tested for this application at the first but now day's specific prototypes developing special features are being built and tested. The Titan VIII walking robot, a four legged robot developed as a general purpose walking robot at the Tokyo Institute of Technology, Japan. For some time now, researchers have been aware of the reservoir of insight available from a well guided stud of existing biological systems. The objective of this research is to develop an efficient terrain negotiations and locomotion for hexapod.

2.LITERATURE SURVEY:

Usha et al [1] explain the DC motor vehicl e moves along the particular column of ploughed la nd for seeding, closing the pits and side by side for sprinkling the water. Nithin& Shivaprakash [2] exp lained the multipurpose machine, which is used for digging the soil, seed sowing, and leveller to close t he mud and water sprayer to spray water with least changes in accessories with minimum cost. Barathk umar& Padma [3] explained to automate the proces s of seeding and fertilizer sprayer, the complete pro cess of mechanism in farming works automatically without any manpower and the energy requirement is very less. Swati D. Sambare, S.S. Belsare [4] exp lained the robot technology plays a permanent role i n all sections like medical field, industries in other c ountries robots are used to perform various function in agricultural field also that some basic function li ke fertilizer spraying seeding in order mange the wa ter usage and also to reduce the human effort. S.S. Katriya et.al [5] explained that the robot made is ec o-friendly the major problem facing in each nation i s water that will be made more useful and also they are also used for fertilizer sprayer and pesticide that will make the crops stronger. Ankitsingh et.al [6] e xplained that the machine performing the operation s autonomously spraying, seeding, and watching th e farms day and night for an effective report and the main function involved in farming i.e., they gradual ly appear advantages in agricultural production to i ncrease productivity and also to enhance the safety. MitulRaval et.al [7] explained the demand of food d rastically increased and in order to meet the heavy d emand of food the farmers had to increase the prod uctivity of the crops so that they can be made mark et ready as fast as fast possible in addition to this in organic fertilizer can be formulated to apply the app ropriate ratio of nutrients to meet the plant growth r equirements. B.N. Shoba et.at [8] explained the see ding and fertilizing the agricultural land in order to produce the food in correct and in healthier manner and also the robotics plays an immense role in all se ction of society and also in various fields but in this it is also involved in agricultural field that will be m ade for reducing the man power work and also to re duce human efforts**.**

3. WORKING METHODOLOGY:

The basic working principle of the six leg kinematic walking with seed and fertilizer sprayer is that the rotational motion of the motor is converted into the (legged) walking motion of the machine. There is a motor connected by the chain drive to the spur gear arrangement of the machine. The spur gear shaft is attached to the legs of the walking robot, so that the robot can convert the rotational motion into the linear motion of the legs. The legs are interconnected with each other so that there exists the linear motion of the legs and the legged action. The DC motor can run through the battery power supply.

One more DC motor is used to spray the

seed by using impeller mechanism. Seed is filled to the hopper arrangement which is made up of mild steel mechanism.

1. Higher energy efficiency.
2. Increased speed.
3. Greater mobility.
4. Improved isolation from terrain inconsistencies.
5. The seeding and water spraying process is done automatically.
6. Reduced manual work.
7. Less time.

Manufacturing processes are shaft, Frame, Rotavator, hopper and plough Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.

3.1 METAL CUTTING

Metal cutting is a process of removing the unwanted material from a block of metals in the form of a chip that will form a desired a shape for the process. This process will make the unwanted materials or unwanted particles to remove in a short span of time that will make the object to look clear & perfect.

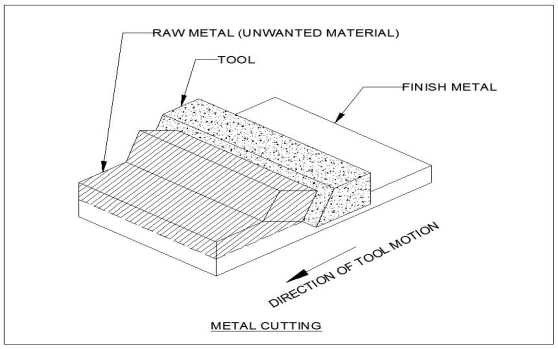

Fig.3.1 Metal cutting process

Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning and milling. Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal in all machining processes, the work piece is a shape that can entirely cover the final part shape. The objective is to cut away the excess material and obtain the final part (Fig. 4.1)

This cutting usually requires to be completed in several steps – in each step, the part is held in a fixture, and the exposed portion can be accessed by the tool to machine in that portion. Common fixtures include vise, clamps, 3-jaw or 4-jaw chucks, etc. Each position of holding the part is called a setup. One or more cutting operation may be performed, using one or more cutting tools, in each setup. To switch from one setup to the next, we must release the part from the previous fixture, change the fixture on the machine, clamp the part in the new position on the new fixture, set the coordinates of the machine tool with respect to the new location of

the part, and finally start the machining operations for this setup.

Therefore, setup changes are time-consuming and expensive, and so we should try to do the entire cutting process in a minimum number of setups; the task of determining the sequence of the individual operations, grouping them into (a minimum number of) setups, and determination of the fixture used for each setup, is called process planning.

3.2 SAWING:

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw (Fig. 4.2)

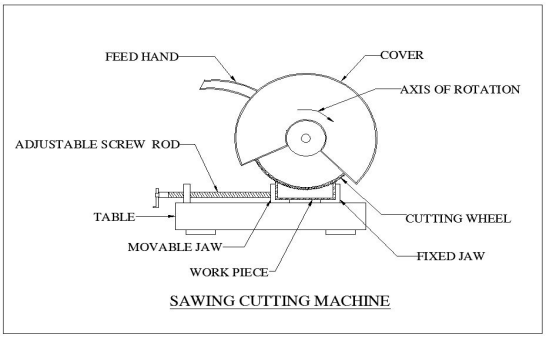

Fig. 3.2 Sawing Cutting Machine

The circular saw blades used with a cold saw are often constructed of high speed steel. Steel blades of this type are resistant to wear even under daily usage. The end result is that it is possible to complete a number of cutting projects before there is a need to replace the blade. High speed steel blades are especially useful when the saws are used for cutting through thicker sections of metal.

Along with the high speed steel blades, a cold saw may also be equipped with a blade that is tipped with tungsten carbide. This type of blade construction also helps to resist wear and tear. One major difference is that tungsten tipped blades can be re-sharpened from time to time, extending the life of the blade. This type of blade is a good fit for use with sheet metal and other metallic components that are relatively thin in design.

3.3 WELDING

Welding is a process for joining similar metals. Welding joins metals by melting and fusing **1,** the base metals being joined and **2,** the filler metal applied. Welding employs pinpointed, localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel Weld joints are usually stronger than or as strong as the base metals being joined (Fig. 4.3)

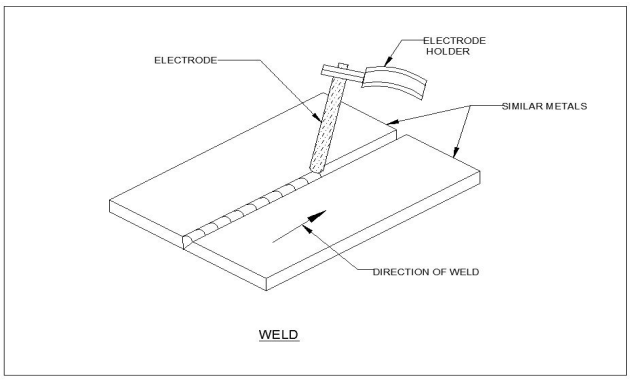

Fig. 3.3 Welding Process

Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks,

furniture, boilers, general repair work and ship building Several welding processes are based on heating with an electric arc. Only a few are considered here, starting with the oldest, simple arc welding, also known as shielded metal arc welding (SMAW) or stick welding. In this process an electrical machine (which may be DC or AC, but nowadays is usually AC) supplies current to an electrode holder which carries an electrode which is normally coated with a mixture of chemicals or flux. An earth cable connects the work piece to the welding machine to provide a return path for the current. The weld is initiated by tapping ('striking') the tip of the electrode against the work piece which initiates an electric arc. The high temperature generated (about 6000°C) almost instantly produces a molten pool and the end of the electrode continuously melts into this pool and forms the joint.

3.4 DRILLNG

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips (Fig. 4.4) from the hole as it is drilled.

Drilling is not useful for very small diameter holes (e.g. < 0.5 mm), since the tool may break and get stuck in the work piece; - Usually, the size of the hole made by a drill is slightly larger than the measured diameter of the drill – this is mainly because of vibration of the tool spindle as it rotates, possible misalignment of the drill with the spindle axis, and some other factors.

For tight dimension control on hole diameter, we first drill a hole that is slightly smaller than required size (e.g. 0.25 mm smaller), and then use a special type of drill called a reamer. Reaming has very low material removal rate, low depth of cut, but gives good dimension accuracy.

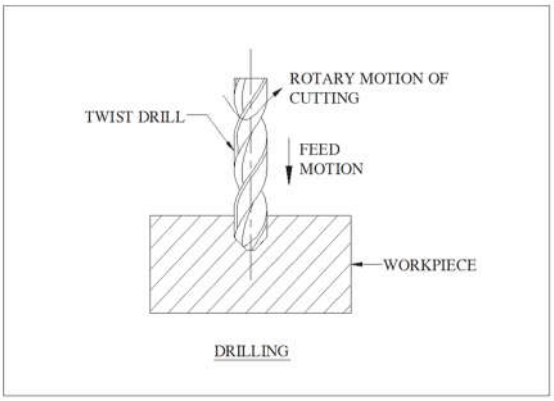

Fig. 3.4 Drilling Process

The geometry of the common twist drill tool (called drill bit) is complex; it has straight cutting teeth at the bottom – these teeth do most of the metal cutting, and it has curved cutting teeth along its cylindrical surface. The grooves created by the helical teeth are called flutes, and are useful in pushing the chips out from the hole as it is being machined. Clearly, the velocity of the tip of the drill is zero, and so this region of the tool cannot do much cutting. Therefore, it is common to machine a small hole in the material, called a center-hole, before utilizing the drill. Centre-holes are made by special drills called center-drills; they also provide a good way for the drill bit to get aligned with the location of the center of the hole. There are hundreds of different types of drill shapes and sizes; here, we will only restrict ourselves to some general facts about drills.

3.5 GRINDING

Grinding, an abrasive machining process that uses a grinding wheel as the cutting tool, is capable of making precision cuts and producing very fine finishes. The grinding head can be controlled to travel across a fixed workspace or work piece can be moved while the grind head remains in a fixed position A precision grinding machine consists of a power-driven grinding wheel spinning at the required speed (which is determined by the wheel's diameter and (manufacturer's rating) and a bed with a fixture to guide and hold the work piece (Fig. 4.5)

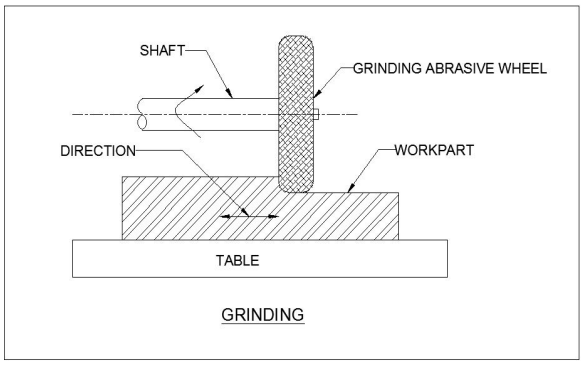

Fig. 3.5 Grinding Process

4. RESULT & DISCUSSION:

Thus the six legged machine has the movement in a proper way and correct way that in a multi terrain manner. The components that are used in the robot are in working in a proper condition and they are working up to our efficiency. Thus the six legged semi-automatic machine gives us satisfaction and makes us to learn more the unknown things

Fig 4 View of the set up

5. CONCLUSION:

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries. We are proud that we have completed the work with the limited time successfully. The six legged semi -automatic machine for agricultural purpose which can seed and spray the water is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus we have developed a "six legged semi- automatic for agricultural purpose which can seed and spray the water" which helps to moving and the respective operation using the developed kinematic machine. By using more techniques, they can be modified and developed according to the applications.

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