DESIGN AND FABRICATION OF AGRICULTURE CUTTER BY USING FOUR BAR MECHANISM

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ABSTRACT

Agriculture is one of the oldest professions but the development and use of machinery has made the job title of farmer a rarity. Instead of every person having to work to provide food for themselves, smaller portion of our population today works in agriculture, the smaller portion provides considerably more food than the other can eat. The basic technology of agriculture machines has changed little in the last century with the coming of the industrial Revolution and the development of more complicated machines. In this work design and fabricate the automatic mechanical cutter by using crank and slotted lever mechanism, for cutting agricultural products like sugarcane for cultivation. The equipment make the use of crank and slotted lever mechanism with one slider to couple with an electric motor using pulley and belt drive.

INTRODUCTION

The working principle behind the operation of simple mechanical cutting machine is four bar chain mechanism particularly crank and slotted lever mechanism. The crank wheel is rotated by the motor through the pulley belt assembly. The rotating motion the crank wheel is converted into oscillating motion by the coupling link by using the slider. The oscillating motion at the other end of the coupling link is converted into reciprocating motion to the blade by using guide hole. Therefore the rotating motion of the crank wheel is converted into reciprocating motion to the blade through the coupling link.

FOUR BAR MECHANISM

A four-bar linkage, also called a four-bar, is the simplest movable closed chain linkage. They perform a wide variety of motions with a few simple parts. Then is paper involves the design, synthesis and fabrication of one such mechanism (four bar mechanism). In this paper four Leg Kinematic movement works on Chebyshev's parallel motion which deals the relation between the links.

LINKAGE

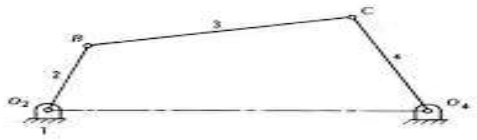
A linkage is an assembly of bodies connected to manage forces and movement. The movement of a body, or link, is studied using geometry so the link is considered to be rigid. The connections between links are modeled as providing ideal movement, pure rotation or sliding for example, and are called joints. The speed ratio and mechanical advantage are defined so they yield the same number in an ideal linkage. A kinematic chain, in which one link is fixed or stationary, is called a mechanism, and a linkage designed to be stationary is called a structure.

MOBILITY

The configuration of a system of rigid links connected by ideal joints is defined by a set of configuration parameters, such as the angles around a revolute joint and the slides along prismatic joints

measured between adjacent links. The geometric constraints of the linkage allow calculation of all of the configuration parameters in terms of a minimum set, which are the input parameters. The number of input parameters is called the mobility, or degree of freedom, of the linkage system. A mechanism with four links is known as simple mechanism, and the mechanism with more than four links is known as compound mechanism.

l = 4 and j = 4. (l=No. of links, J=No. of Joints)



n=3(l-1)-2*J

∴n = 3 (4 – 1) – 2 × 4 = 1- One Degree of Freedom

In this paper, researchers used 4 set of four bar mechanism.

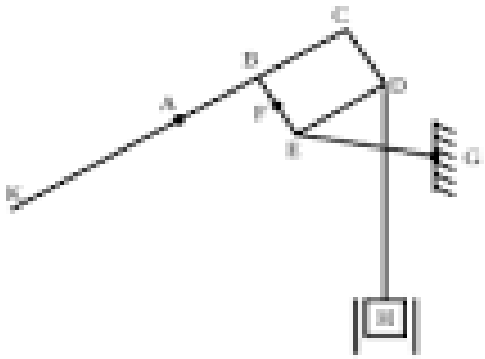
LITERATURE SURVEY

A large number of research papers have been studied on four bar link mechanism. A review of related literature has been described as under:

Hamid M. and Saeed A. (2008) concluded that Watt's six-bar mechanism generates straight and parallelmotion. This mechanism can be utilized for legged machines. In this mechanism, the leg remains straight during its contact period due to its parallel motion.

PARALLEL MOTION MECHANISM

Chebyshev Parallel Motion -a linkage, by P.L.Chebyshev in 1868, such that some point on it describes a nearly straight line. A straight-line mechanism, the Chebyshev parallel motion is a four-bar linkage ABCD in which the lengths of the links satisfy the relation 3d– a= 2b.



The basic concept of the four leg parallel motion walking machine was derived from Chebyshev parallel motion concept.

r= radius of driving arm (AB) = 30mm

a= length of guiding arm (CD) =2*r=60mm

d=length of big arm=2*a=2*60=120 mm.

CRANK MECHANISM

DEFINITION

This machine is basically works on the principle of Single Slider Crank Mechanism which is the heart of this machine and it converts rotary motion into a reciprocating machine to crush the Cans/Plastic bottles. In this, link 1 is fixed and link 2 which is a crank is rotating about fixed link 1 and converts this rotary motion into the reciprocating motion of slider (corresponds to the link 4) by means of connecting rod which corresponds to the link 3. This is the inversion of single slider crank which is obtained by fixing link.

LINKAGE MECHANISM

A linkage is a mechanism formed by connecting two or more levers together. Linkages can

be designed to change the direction of a force or make two or more objects move at the same time. Many different fasteners are used to connect linkages together yet allow them to move freely such as pins, end-threaded bolts with nuts, and loosely fitted rivets.

SLIDER MECHANISM

Common to most reciprocating engines is a linkage known as a crank-slider mechanism. Diagrammed in Figure.5, this mechanism is one of several capable of producing the straight-line, backward-and-forward motion known as reciprocating. Fundamentally, the crank-slider converts rotational motion into linear motion, or vice versa.

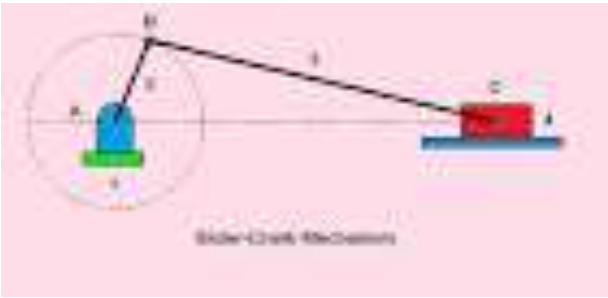
The position of the piston with respect to the crank center line problem for the control is given by

x = (S/2) cos + Lcos Ø [ft | m] ..... (1)

where,

yA = (S/2) sin = L sinØ can be used to eliminate Ø to obtain

X/L = (S/2L) cos + [1-(S/2L)si n] ½



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DOUBLE CRANK MECHANISM

The mechanism of coupling rod of a locomotive which consist of four links as shown in figure-5. In this mechanism, the links AD and DC (having equal lengths) act as cranks and are connected to the respective wheel. The links CD acts as a coupling rod and the link AB is fixed in order to maintain a constant center to center distance between them. This mechanism is meant for transmitting rotary motion from one wheel to other wheel.

SIMPLE PLANAR LINKAGES

Reverse –Motion Linkage

Can make objects or force move in opposite directions; this can be done by using the input link as a lever. If the fixed pivot is equidistant from the moving pivots, output link movement will equal input link movement, but it will act in the opposite direction. However, if the fixed pivot is not cantered, output link movement will not equal input link movement.

Push-Pull Linkage

Can make the objects or force move in the same direction; the output link moves in the same direction as the input link. Technically classed as a four-bar linkage, it can be rotated through 360° without changing its function.

Parallel Motion Linkage

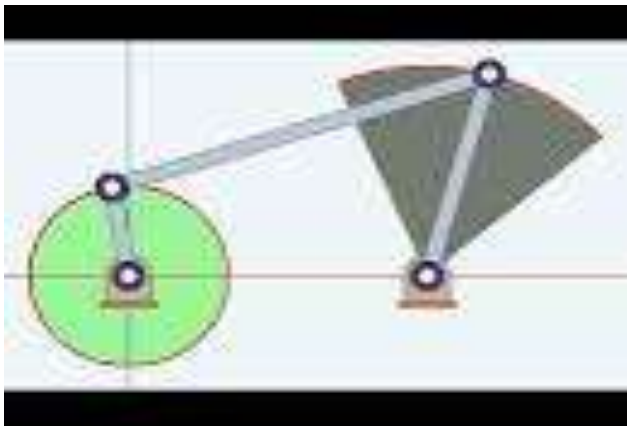
Can make objects or forces move in the same direction, but at a set distance apart. The moving and fixed pivots on the opposing links in the parallelogram must be equidistant for this linkage to work correctly. Technically classed as a four-bar linkage, this linkage can also be rotated through 360° without changing its function. Pantographs that obtain power for electric trains from overhead cables are based on parallel-motion linkage.

Bell-Crank Linkage

Can change the direction of objects or force by 90°. This linkage rang doorbells before electric clappers were invented. More recently this mechanism has been adapted for bicycle brakes. This was done by pinning two bell cranks bent 90° in opposite directions together to form tongs. By squeezing the two handlebar levers linked to the input ends of each crank, the output ends will move together.

CRANK ROCKER MECHANISM

The four bar linkage is the simplest and often times, the most useful mechanism. As we mentioned before, a mechanism composed of rigid bodies and lower pairs is called a linkage (Hunt 78). In planar mechanisms, there are only two kinds of lower pair sand revolute pairs and prismatic pairs. The simplest closed-loop linkage is the four bar linkage which has four members, three moving links, one fixed link and four pin joints. A linkage that has at least one fixed link is a mechanism. This mechanism has four moving links.



FUNCTION OF LINKAGE

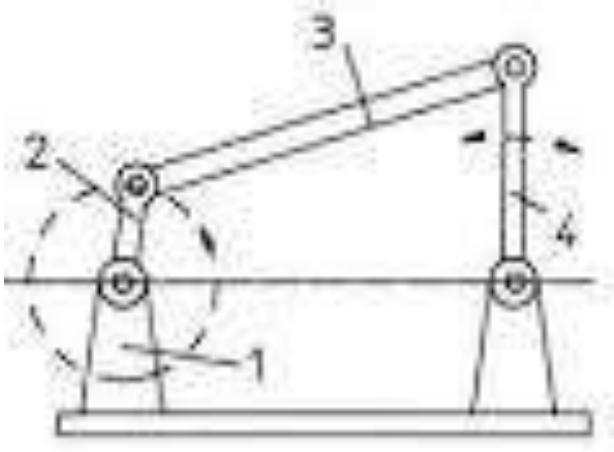
The function of a link mechanism is to produce rotating, oscillating, or reciprocating motion from the rotation of a crank or vice versa . Stated more specifically linkages may be used to convert:

1.) Continuous rotation into continuous rotation, with a constant or variable angular velocity ratio.
2.) Continuous rotation into oscillation or reciprocation (or the reverse), with a constant or variable velocity ratio.
3.) Oscillation into oscillation, or reciprocation into reciprocation, with a constant or variable velocity ratio.

FOUR LINK MECHANISM

One of the simplest examples of a constrained linkage is the four-link mechanism. A variety of useful mechanisms can be formed from a four-link mechanism through slight variations, such as changing the character of the pairs, proportions of links, etc. Furthermore, many complex link mechanisms are combinations of two or more such

mechanisms. The majority of four-link mechanisms fall into one of the following two classes:



In the range of planar mechanisms, the simplest group of lower pair mechanisms are four bar linkages. A four bar linkage comprises four bar-Shaped links and four turning pairs as shown.

Some important concepts in link mechanisms are:

1.) Crank: A side link which revolves relative to the frame is called a crank.
2.) Rocker: Any link which does not revolve is called a rocker.
3.) Crank-rocker mechanism: In a four bar linkage, if the shorter side link revolves and the other one rocks (i.e., oscillates), it is called a crank-rocker mechanism.
4.) Double-crank mechanism: In a four bar linkage, if both of the side links revolve, it is called a double-crank mechanism.
5.) Double-rocker mechanism: In a four bar linkage, if both of the side links rock, it is called a double-rocker mechanism.

STEEL FRAME

INTRODUCTION

Steel buildings are more flexible than RCC building but they display lateral deflection than RCC building. A Bracing is a system that is provided to minimize the lateral deflection of structure. A Braced Frame is a structural system which is designed primarily to resist wind and earthquake forces. Braced frames are classified as concentric braced frames (CBF) or eccentric braced frames (EBF). Concentric braced frames are frames in which the center line of the member that meet at a joint, intersect at a point to form a vertical truss system which resists lateral forces.

.METHODOLOGY

1. A thorough literature review to understand the basic concept of the topic like seismic evaluation of building structures, Response Spectrum analysis, and linear Time History analysis by referring books, technical papers or research papers.
2. Data collection.
3. Seismic behaviour of steel frames with various bracings bracing configuration.
4. Modeling the steel frame with various bracing configuration by computer software ETABS2013.
5. Carry out Equivalent Static analysis, Response Spectrum analysis and linear Time History analysis on the models.
6. Interpretation of results & conclusion.

NUT AND BOLT

INTRODUCTION

The human perception of identifying an object is the natural logical thinking process by which humans recognise an object. But, machines are far behind the human recognition system of an object, so researchers are up -to increasing this efficiency of the machines.

The nut and bolt recognition is useful phenomenon in the automotive industry where large number of various shape nut and bolts are used. In this paper we are reviewing the methodologies which are earlier used for the recognition of nut and bolts. The paper is divided into 1.introduction, 2.software framework, 3.Methodology, 4.Performance evaluation and 5.references.

SOFTWARE FRAMEWORK

The three processes which we are going to discuss in this paper are as below:

Radius Variation Detection: The working of this algorithm requires edge detection of the acquired images from camera of nut and bolt, canny algorithm is used for detection of edges of nut and bolt (pre Witt algorithm can also be used for the purpose).After detecting the edges centre of nut or bolt is then determined, from these centres the radius at every 20 degrees of an angle is taken. This gives unique 18 values for different shapes and sizes of nut and bolts which can be used as feature extraction data for the artificial neural network input.

Principle Component Analysis: The camera acquired images from like web camera of nut and bolt, image enhancements are done before applying principle component analysis as feature extraction tool for more accuracy of results.

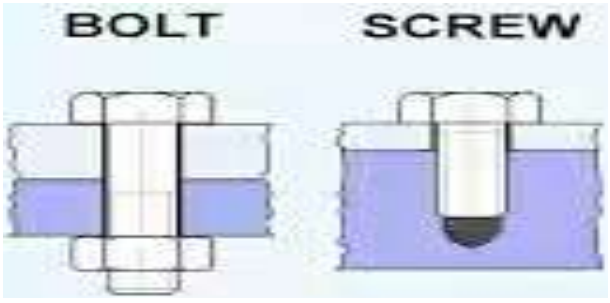
The targets are set for recognition of nut and bolt for individual recognition parameters. After the performance parameters are meeting the network is saved for simulation.

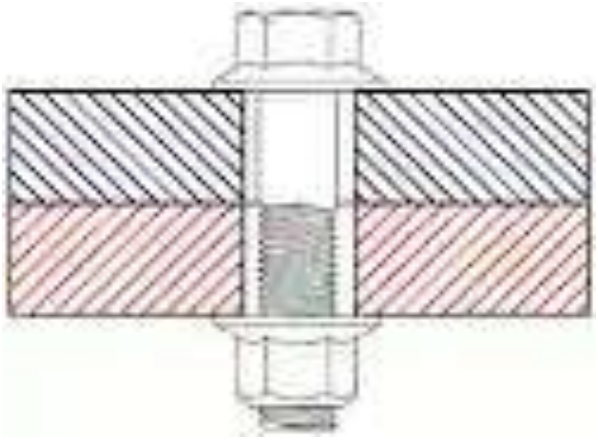
Stationary Wavelet Transform: The camera acquired images from like web camera of nut and bolt, image enhancements are done before applying stationary wavelet transform as feature extraction tool for more accuracy of results.

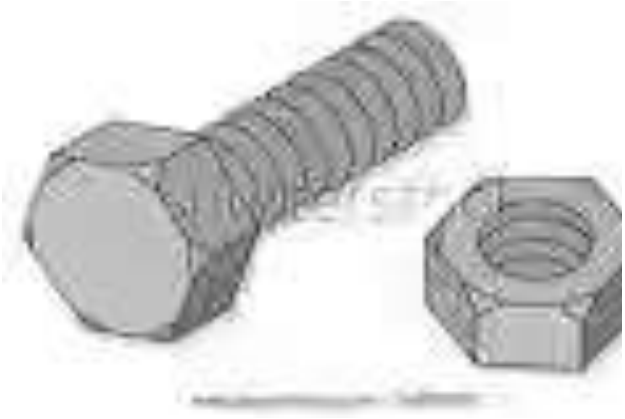
The feature extracted data of individual nut and bolts are given to the input of artificial neural network for training.

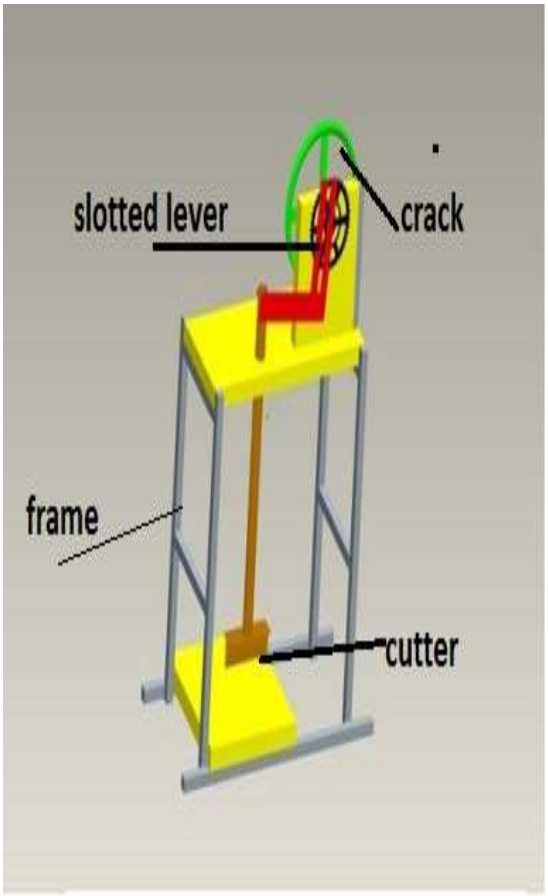
PERFORMANCE EVALUATION

In this paper, we have touched the topic of performance evaluation of three feature extraction techniques which is given to the artificial neural network for recognition of nut and bolt. We noticed that it becomes more and more urgent to correctly and appropriately evaluate computer vision algorithm performance. Therefore a generic evaluation system must be constructed for bench marking.









WORKING PRINCIPLE

In Both Induction And Synchronous Motors, The Ac Power Supplied To The Motor's Stator Creates A Magnetic Field That Rotates In Time With The Ac Oscillations. Whereas A Synchronous Motor's Rotor Turns At The Same Rate As The Stator Field, An Induction Motor's Rotor Rotates At A Slower Speed Than The Stator Field. The Induction Motor Stator's Magnetic Field Is Therefore Changing or Rotating Relative To The Rotor. This Induces An Opposing Current In The Induction.

ADVANTAGES

1. It is very easy to operate.
2. The design is simple.
3. Less maintenance.
4. Initial cost of the machine is very low.
5. Quick processing.
6. No need of skilled labours.
7. Less floor space required.

APPLICATIONS

1. Used to cut sugarcane and kappa of required size for cultivation.
2. With less modification in this machine,

3. We can use this to cut wooden pieces of required size for boilers.
4. By coupling a conveyor mechanism.
5. It automatically feed the object to be cut for large scale cutting.

CONCLUSION

This work is made with preplanning and it provides flexibility in operation. This innovation is more desirable and economical and makes the use of peculiar mechanism. This design and fabrication of automatic mechanical cutter use four bar link mechanism is designed and fabricated with the hope that it is very economical and according to the torque given in the crank wheel it may be used in different fields. This work helped us to know the periodic steps in completing a project work, and how to work in group and achieving the goal. Thus we have completed the project successfully.

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