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Design and Fabrication of Automatic Wall Plastering Machine Prototype

Dattaram K.Gawas
Final Year Student,
Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Visakhapatnam.

B.Vamsi Krishna
Assistant Professor,
Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Visakhapatnam.

E.Kishore Kumar
Final Year Student,
Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Visakhapatnam.

K.Sai Krishna
Final Year Student,
Department of Mechanical Engineering,
VITS College of Engineering,
Sontyam, Visakhapatnam.

ABSTRACT:

The building construction is one of the most unfamiliar R&D activities in the robotics and automation community. Nevertheless, the building construction is one of the oldest and largest economic sectors. Intense competition, shortages of skilled labour, increase in labour cost and technological advances are forcing rapid change in the building construction. Building construction is divided into two large groups: commercial infrastructure and residential building. Both areas are needed plastering work for increasing the quality of construction. Machines has been developed to automate the plastering work is very much demand for construction field.The problem addressed is plastering of walls and ceilings during the construction of apartment and office buildings. The concrete walls are to be covered by a smooth layer of plaster, a few millimetres thick. The workspace is structured enough that map generation, navigation and motion planning can be performed autonomously.

KEY WORDS: DC motor's, Display, Fabricated structure, remote switches, sensors, Microcontroller, rope and pulley.

I. INTRODUCTION:

Now a day's construction revolution has made the contractors to equip their construction in such a way so as to perform the highest output with as minimum construction cost as possible.

In order to have highest output the parameters like accuracy, precision, quality and cycle time have to be optimised, this optimisation is possible either by having a skilled man power or automating the system. In the first case, continuously doing the same kind of work for long time will cause fatigue resulting in lower efficiency. So it would be better to automate the system if work nature if of same is in case of large construction. With the automation it is also possible to have higher efficiency, accuracy and quality. Contractors are also concerned with safety levels of the worker as well; automation also provides a solution on the safety aspects of both worker and machine.

With the constant increase in the demand of the construction, the contractors are forced to increase their construction and also the quality of the construction to remain in the competitive market. The construction industry in most countries amounts to 10–20% of the GNP, making it the largest economic employing sector. It is still labour demand and also most of the work involved is repetitive. The growth of any country is dependent on the construction industry hence it is of prime economic significance to many industrial sectors. Intense competition, shortages of skilled labour and technological advances are forcing rapid change in the construction industry, thus encouraging its automation in this industry.

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The construction of buildings, apartment, complex, shops, homes are basic requirements of human being. In this construction area plastering is necessary for decorating the wall. Plastering works refers to construction or ornamentation done with plaster, such as a layer of plaster on an interior wall or plaster decorative moldings on ceilings or walls. This is also called plastering. The process of creating plasterwork called plastering. Tools and materials include trowels, floats, hammers, screeds, a hawk, scratching tools, utility knives, laths, lath nails, lime, sand, plaster of Paris, a variety of cements, and various ingredients to form color washes.

Plasterers will typically divide a room, (especially a large or high-ceilinged wall) into top and bottom. The one working on top will do from the ceiling's edge to about belly height and work off a milk crate for an 8-foot (2.4 m) ceiling, or work off stilts for 12-foot-high rooms. For cathedral ceilings or very high walls, staging is set up and one works topside, the others further below.

II. WORKING TECHNIQUE:

Figure 1 shows the trowel operation technic in traditional plastering method. The correct plastering technique is essential with only the trowel being used to apply and finish the skim coat. Achieving a good finish is the combination of firm pressure combined with the correct angle of trowel (how far the leading edge is from the wall).

Plastering Technique for applying plaster is initiated by trowel loaded with plaster, and then leading edge of the trowel will be a long way from the wall. The leading edge need to be flattened gradually into the wall. With the next stroke the trowel will be used for flattening out the plaster as just applied. There will be no plaster on trowel and it will be fairly flat - the leading edge will be approximately 10 – 15 mm away from the wall.

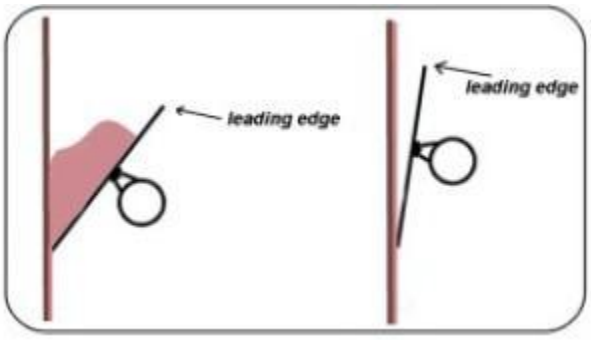

Fig.1 Trowel operation technique.

Firm pressure will push the plaster flat and even. The pressure applied through the trowel is to be considered for the evenness and angle is maintained as required. If the leading edges is more than 15 mm away from the wall then the trowel will start to scrape plaster off the wall. Close this angle down so that it is 10 - 15 mm away and can push hardly and it will give a nice clean even, hollow free application. This plastering technique is crucial to maintain good consistence at all times. With the correct method speed will then increase very quickly.

III. WORKING:

The machine consists of a foam plastic frame, tray supported by M.S angular, guide ways, thickness adjuster and motor. Initially, the plastering machine has to be placed near the wall which has going to plaster. The machine should be perfectly leveled. The lifting force is transferred to tray through power screw, which driven by DC motor. The lifting force is given by a belt and pulley mechanism. The main part is fixed to vertical column of pipes frame and another part of guide way is fixed to tray setup. Using lifting setup, this consists of four bar link mechanism. By opening the hopper, the liquid starts flowing into the guide ways which were placed near to the wall. Then the liquid sticks to the wall from lower to upper position.

IV. PARTS AND ITS WORKING:

DC MOTARS:

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and

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the ball bearing motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source -- so they are not purely DC machines in a strict sense.

Brushed DC motors:

The classic DC motor design generates an oscillating current in a wound rotor with a split ring commutator, and either a wound or permanent magnet stator. A rotor consists of a coil wound around a rotor which is then powered by any type of battery. Many of the limitations of the classic commutator DC motor are due to the need for brushes to press against the commutator. This creates friction. At higher speeds, brushes have increasing difficulty in maintaining contact. Brushes may bounce off the irregularities in the commutator surface, creating sparks.

This limits the maximum speed of the machine. The current density per unit area of the brushes limits the output of the motor. The imperfect electric contact also causes electrical noise. Brushes eventually wear out and require replacement, and the commutator itself is subject to wear and maintenance. The commutator assembly on a large machine is a costly element, requiring precision assembly of many parts. there are three types of dc motor 1. dc series motor 2. dc shunt motor 3. dc compound motor - these are also two type a. cumulative compound b. deffercial compound.

FOAM PLASTIC :

Plastic is a material consisting of any of a wide range of synthetic or semi-synthetic organics that are malleable and can be molded into solid objects of diverse shapes. Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural.[2] Plasticity is the general property of all materials that are able to irreversibly deform without breaking, but this occurs to such a degree with this class of moldable polymers that their name is an emphasis on this ability.

Due to their relatively low cost, ease of manufacture, versatility, and imperviousness to water, plastics are used in an enormous and expanding range of products, from paper clips to spaceships. They have already displaced many traditional materials, such as wood, stone, horn and bone, leather, paper, metal, glass, and ceramic, in most of their former uses. In developed countries, about a third of plastic is used in packaging and another third in buildings such as piping used in plumbing or vinyl siding. Other uses include automobiles (up to 20% plastic), furniture

SWITCHES:

A switch is a mechanical device used to connect and disconnect an electric circuit at will. Switches cover a wide range of types, from subminiature up to industrial plant switching megawatts of power on high voltage distribution lines.In applications where multiple switching options are required (e.g., a telephone service), mechanical switches have long been replaced

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by electronic switching devices which can be automated and intelligently controlled.

DPDT (double pole double through)

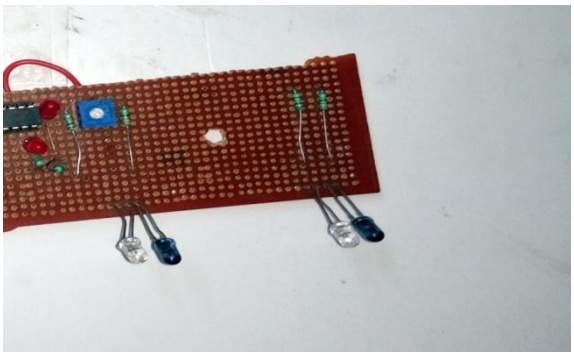
SENSORS:

A sensor is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an (today mostly electronic) instrument. For example, a mercury-in-glass thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors are calibrated against known standards. Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base. There are also innumerable applications for sensors of which most people are never aware. Applications include cars, machines, aerospace, medicine, manufacturing and robotics.

IR SENSOR:

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation is the region having wavelengths longer than visible light wavelengths, but shorter than microwaves.

The infrared region is approximately demarcated from 0.75 to 1000µm. The wavelength region from 0.75 to 3µm is termed as near infrared, the region from 3 to 6µm is termed mid-infrared, and the region higher than 6µm is termed as far infrared.



Infrared technology is found in many of our everyday products. For example, TV has an IR detector for interpreting the signal from the remote control. Key benefits of infrared sensors include low power requirements, simple circuitry, and their portable feature.

PIPES:

Attach the pipe holders(4) on the upper surface of the box

Insert the 4 PVC pipes into the pipe holders.

WHEELS

Wheels were made up of PLASTIC

Diameter of each wheel is 6cm

4 wheels were used in this model.

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RESULTS

V. ADVANTAGES:

Automatically Adjust the Thickness of Plastering.

Automatically Adjust the Joint of Plastering.

Automatically Adjust the Perpendicularity.

Automatically Adjust the Machine Requirement for Uneven Land.

VI. CONCLUSION:

With this development the two major problem construction industries currently facing can be reduced.

They are skilled labour shortage and Quality in the construction process with less wastage. Through the trials it is noted that the machine is more productive compare to the labour with respect to the plastering work and also the quality achieved is almost equivalent to the labour.

FUTURE SCOPE:

The project can further be improved by adding or modifying by following features:

- Attaching an solar panel for power generation in case of sudden power down cases.
- This machine can also be used for wall putties.
- By installing the roller in the place of hopper, we can use it as wall painting robot.
- By placing wipers in this machine, we can use it as wall cleaning robot for large buildings.
- For the higher buildings,this can be used as material lifter machine.

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