# ANALYZATION OF BONE DEPTH USING DRILLER ROBOT

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***Abstract***—Robots are increasing popularly, as they are able to perform complex procedures to get great accuracy and precision than humans can. This type of robot is typically used in the medical field to assist in surgeries and other medical procedures. Industry translation of social robots has also begun in service and hospitality sectors, though challenges in reliability and acceptance by humans remain unresolved . In this study, we develop a practical approach to design simplified affective robots to drill the bone upto the mark. This types of robot can be used to reduce the amount of time required for a surgery,as well as provide a proper result."BONE DRILLING" is the most executed one in the orthopedic surgery concerning the operative treatment of bone fractures.The drilling process is characterized by a number of input and output parameters. The most important input parameters are the feed rate [mm/s] and the drill speed [rpm]. The optimal results of the manipulations can be assured only when the input parameters are under control during an automatic execution of the drilling process.

**Keywords**—Automatic bone drilling, handheld robotized surgical drill, speed control, depth control.

## I. INTRODUCTION

Bone drilling is a common surgical procedure . How to make robots realize safe and autonomous bone drilling procedures is an urgent clinical need. In neurosurgical interventions, a "burr hole" channel must be drilled into the skull for instruments to reach the intracranial brain area . In pedicure screw placement operations, it is also necessary to predrill a channel on an uneven vertebral surface to ensure accurate screw placement. Although current stereo-tactic surgical robots can already accurately determine drilling position and direction , the final feeding operation still needs to be manually completed. Surgeons need to be extremely careful not only to push the drill tool forward to reach the predetermined drilling depth but also to be ready to withdraw at any time to prevent accidental outcomes, such as drill breakthrough, overshoot,slippage, and breakage, from damaging the brain tissue, spinal cord, and other key anatomical structures. A bone drilling procedure is usually carried out under minimally invasive conditions, and it is difficult to directly observe the interaction state between the drill bit and the bone. .

The bone drilling process is a basic manipulation in the osteosynthesis of the bone fractures. Osteosynthesis is a surgical procedure, which stabilizes and joins the ends of fractured (broken) bones by mechanical devices such as metal plates, screws, pins, rods, wires. Nowadays by statistics every year about one million people in Europe need such an operation where implants into bones are inserted. The process of bone drilling is characterized by a number of input and output parameters.The input parameters define the conditions under which the process occurs, while the output parameters determine the outcome of the process. The input parameters as feed rate [mm/s] and drill speed [rpm] are of the greatest importance for the final result of the drilling process: thermal and mechanical damages of the bone tissue, hole quality, second cortex breakthrough detection and penetration depth in the case of bi-cortical bone drilling.

## II. LITERATURE SURVEY

This literature survey is combination of drilling and Robot image processing : A drilling robot optimized to bend removes the lesion, while an endoscopic robot provides visual feedback as well as suction and irrigation for cleaning the inner bone. Two leader devices are used to precisely control the movement of each robot in a leader–follower configuration. The performance of the proposed system was evaluated in a series of experiments on animal femur to control the remote[1].[2] says two important and difficult tasks during a bone drilling procedure are guiding the orientation of the drilling axis toward the target and maintaining the orientation against the drilling force. To accomplish these tasks, a remote center of motion (RCM) mechanism is adopted to align the orientation of the drilling axis without changing the entry point. In addition, several X-ray images are necessary to identify the position of the drill during the procedure, thereby exposing the patient and the clinical personnel to radiation[3].[4]-[7] Most drilling robots use a serial robot arm, which has numerous degrees-of-freedom (DOFs) for positioning and guiding the orientation of the drill.[8] in Surin Sunson,Dechrit Maneetham,Myo Min Aung et al explains the method Manual inspections and executions in factory operations are not efficient, with many issues regarding accuracy, precision, and control. This research presents the development of camera vision to classify the different colors of the target object and works with parallel robots to pick and place objects.The experimental result is found satisfactory and can be used effectively. The accuracy of image processing detection is 100.00%, and the kinematic of the robot actuator for picking and placing to the correct position is 100%. Therefore this automated part inspection by image processing system was able to increase work's efficiency and reliability to enhance customer's satisfaction.[9]. [10] say a surgical robot for spinal fusion and its control framework that provides higher operation accuracy, greater flexibility of robot position control, and improved ergonomics.This poses several impediments in the delivery of high-quality health and social care. Socially assistive robot (SAR) technology could assume new roles in health and social care to meet this higher demand[11].

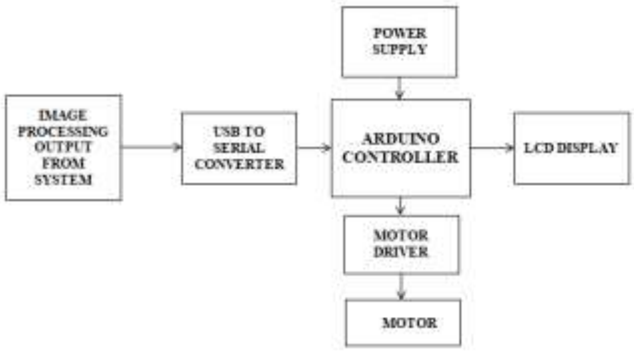
## III. EXISTING SYSTEM

The existing system is used to real-time image processing based on Micro-controller controlled Parallel Robot .Then also robot used to guide a surgeon in the process of drilling. Medical robots can be programmed to perform specific tasks, such as stitching wounds, reducing incisions, and controlling instruments.They can also be used to monitor a patient's vital signs, diagnose and treat medical conditions, and even provide personalized health advice. But not involved in bone drilling process.

## IV. PROPOSED SYSTEM

An embedded based automatic bone driller is a robot device designed to automate the process of drilling holes into bone. This system would allow for the automated drilling of bone by a robotic arm.This type of robot is typically used in the medical field to assist in surgeries and other medical procedures.The robot is also capable of performing complex tasks such as drilling in different depths and angles.

BLOCK DIAGRAM




WORLING PRINCPLE

The image processing technique is extremely helpful for several applications like biomedical, security, satellite imaging, personal image, medicine, etc. The implementation of image processing such as image enhancement and feature segmentation and feature excitation are used for fracture detection. This paper uses canny edge detection methodology for segmentation. The main aim of this research is to detect Bone fractures using image processing using MATLAB. The proposed system has the following steps, namely, preprocessing, segmentation, and fracture detection. Feature extraction is the main task of the system. the results from various experiments show that the proposed system is very accurate and efficient. So, for that quick and accurate diagnosis crucial to the success of any prescribed treatment. Depending upon the human experts alone for such a critical matter have cause intolerance errors. Hence the thought of automatic identification procedure has perpetually been associate degree appealing one. The main goal of the paper is to detect the bone fracture from X-ray images using MATLAB software.

We use Arduino controller to get the data serially from the system, the criticality of crack is identified through the Serial converter by values. Based upon the values through serial the drilling process is done using DC motor.

## V. METHODOLOGY

STEP 1: CONTRAST ENHANCEMENT OF IMAGE.
STEP 2: IMAGE SEGMENTATION AND FEATURE EXTRACTION USING CNN.
STEP 3: CONVERTS RGB IMAGE TO GREYSCALE TO IDENTIFY THE AFFECTED AREA.
STEP 4: DATA GET TO CONTROLLER FROM THE SYSTEM AND THE BONE DRILLING PROCESS IS DONE USING DC MOTOR.

## VI. RESULT AND DISCUSSION

The result is presented on the display after drilling manipulation. The second row of the display screen (**Figure 1**) shows: first number - the thickness of the near cortex (Cortex I); second number - the thickness of the far cortex (Cortex II); third number - the depth of the hole. The second row in **Figure 2** in the same manner shows the thickness of the near cortex (first number), the distance between both cortices (marrow) and the depth of the hole (third number).


Figure 1 (Cortex I)


Figure 2 (Cortex II)

The process of bone drilling is characterized by a set of input and output parameters. The input parameters define the conditions under which the process takes place, while the output parameters determine the outcome of the process. Many scientific investigations are done concerning input parameters as drill speed, feed rate, different types of drill bit, its diameter, bone type and drilling methods. These parameters are responsible for heat generation, micro cracks,breakthrough detection and penetration.

## VII. CONCLUSION

Robotic technology has revolutionized the healthcare industry, providing doctors and patients with a wide range of benefits. Medical robots can provide a higher level of accuracy and precision than human hand allowing for greater speed and accuracy in surgeries.In addition, medical robots can significantly reduce the risk of infection, reduce recovery time, and increase hospital efficiency.

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