

Research Article

JMR 2021; 7(1): 4-5 January- February ISSN: 2395-7565 © 2021, All rights reserved www.medicinearticle.com Received: 18-11-2020 Accepted: 31-12-2020

Development of Device for Dentist Implant Orientation

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Abstract

Doctors have always wondering the new technology and improvement in the up gradation of the current technology; Dental Procedures and Surgery is always critical as it is the major operation which everybody experiences once in the entire life span. To resolve the complexity of the dental surgery on Implant device like brackets, this device is developed to pre-define the angular disposition based on structure of the teeth and also location and direction where to implant the bracket for braces and help to locate the exact position on the teeth were the surgery is to be executed were parts can mounted at a perfect angle in the human mouth.

Keywords: Dentistry, Implant Surgery, Brackets, Braces, Doctors, Medical Instrument.

INTRODUCTION

Dental brackets are a temporary implant on teeth anchored on which the braces pull teeth into alignment. However, each tooth that needs correction has a different alignment, and so the anchor bracket needs to be positioned at the correct angles in all three axis for best results.

Currently this is done manually and involves great deal of the Dentists judgement and accuracy is not very high, with margins of error of 3 to 6 degrees depending on experience of the dentist.

In this system we have used the Arduino controller which will receive signal in the form of voltage and that voltage will be converted into angular position using the Acceleration Sensor ADXL335 which will be interface with the controller board, further the results can be displayed on the serial monitor screen.

Literature review

The principle of this device has been in use elsewhere. For example: intelligent device positioning and mobility, rovers and flying robots to stabilize their flights for enabling camera capture of field of view. However, [2] this has not been used in Dental Bracket positioning. So, implicating the same fundamental into the development of medical instrument which will give a good success in the field of biomedical surgical instruments, blending mechatronics system into the product design. [1] The Implant method for orthodontics were the braces were going to stud on the mouth easily after capping the teeth which will fix the teeth.[3] The concept of measuring the location which was defined with help of accelerometer sensor is the main key element for measuring the angle of rotation in the mouth [5] various methods were used to measure but the three axis was one of the best method which is very useful in the project to identify the degree of freedom to have a identical result what the doctors are required.

MATERIALS & METHODS

In this Implant Orientation, the major component used are based on digital electronics components, Arduino Uno is the main key to the project as it is the heart of the controlling system, it gives signal and receive signal from the sensors. The acceleration sensor ADXL335 is used for monitoring the direction in three axis X, Y, Z which gives signal in terms of voltage to controller and controller convert the voltage into the digital numbers. As the Implant Stand is made on wooden base which is connected with the steel pipe and on top of that again the wooden ply is attached to give support and assemble the circuit on the wooden plate, the height of the stand is fix and stationary as it is taken with reference to the dentistry chair. Also, the implant orientation can take to any place it is flexible to carry and easy to fix.

Working Principle

The Product is working on 12-volt Dc supply, the controller board is connected with the serial monitor

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Assistant Professor, Design and Manager Maker Space, Anant National University, Ahmedabad, Gujarat-382115, India Email: parth1610shah@gmail.com screen on which the angle and degree position is shown, the sensor ADXL335 which is acceleration sensor which is connected with the analog pins of the controller and the analog value which is measured by the sensor is being converted into the voltage and that voltage is converted into the degree of rotation. In figure 1 the small entity is made to place the sensor and with that the implant clinical tool is mounted in which the braces, cap or bracket it to be hold in that clinical tool, once the bracket is placed in the clip of the tool, the tool can be moved into 360° into the space with reference to the internal space of the mouth, with the free rotation in the mouth the tool will move on the same time on screen the value of degree will get to know by the doctor who is going to do surgery. As the controller accept the code and it will convert that code into the binary logic and it will show the result.



Figure 1: Implant Orientation Model

```
//double PI = 3.14159265359
  int ave=10;
int xRead=0, yRead=0, sRead=0;
int xAng=0, yAng=0, sAng=0;
double x=0, y=0, s=0;
for(int i=0; i<ave ; i++)</pre>
xRead += analogRead(A0);
         = analogRead(Al);
yRead
sRead += analogRead(A2);
xRead = xRead/ave;
yRead = yRead/ave;
sRead = sRead/ave;
xAng = map(xRead, xMinVal, xMaxVal, -90, 90);
yAng = map(yRead, yMinVal, yMaxVal, -90, 90);
sAng = map(sRead, sMinVal, sMaxVal, -90, 90);
x = rAD_TO_DEG * (atan2(-yAng, -sAng) + PM);
y = rAD_TO_DEG * (atan2(-xAng, -sAng) + PM);
  = rAD TO DEG * (atan2(-yAng, -xAng) + PM);
Serial.p
  serial.print(x);
Serial.print("\t'
```

```
Serial.print(y);
Serial.print("\t");
Serial.print(s);
Serial.print("\n");
```

```
delav(1000):
```

RESULTS & DISCUSSION

One can observe in the serial monitor, there are three axis X, Y, Z which is shown on screen (Figure 2.) with respect to the reference of the teeth inclination previously measured by the dentist or the surgeon they can easily add or subtract the degree and position and they can fix the bracket, Cap or Braces. One can observe the difference in reading in figure 2, due to continue movement of implant tool clipper the value of reading gets change and it will reflect on 3 Axis within the limit of 360° space inside the mouth.

CONCLUSION

Here with the implementation of the product attending Dentist can easily fix the patients teeth brackets. No digital technique was used previously to monitor the movement as the doctors use to mount the medical devices with their expertise and experience.

This will surely help the patient to get the perfect implant treatment and they will not suffer problem after implant. In the unassisted technique, there were issues of misalignment, necessitating removal and reapplication of the bracket in a follow up procedure, costing both time, effort and dissatisfaction to the patients.

Implementing this technique, eliminates these consequences and they will get the accurate result for both doctors and patients. With this the patient does not have to go for follow up procedure again for the same teeth, saving patient's time and money.

Acknowledgments

The success and final outcome of this project required a lot of guidance and assistance from many people. I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them. I respect Dental team for guidance and support in this project which made me complete my product ready. I will also thank my parents and family to give me support all time whenever I need. Even my Technician who helped me in managing the resources and small inputs which lead to the completion of the project.

Conflicts of interest

The authors declared no conflict of interest.

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Figure 2: Code for Implant Orientation