

**ENHANCED ORTHOPEDIC DRILL FOR BONE  
SURGERY WITH HAPTIC INTERFACE**

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Degree of Master of Science

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Sri Lanka

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Thesis submitted in partial fulfillment of the requirements for the degree Master of  
Science in Engineering

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## **DECLARATION**

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Dr. A. M. Harsha S. Abeykoon

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Nipuna Chathuranga Illangarathne

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## **ABSTRACT**

Nowadays novel technology adoption is popular among the biomedical research areas. This research explores a way of improving precision, robustness, and accuracy of orthopedic surgeries. Orthopedic drills and saws are handheld devices driven by pneumatic or electric actuators. This research primarily considers on the orthopedic drill, which is used to produce holes in bones.

Orthopedic surgeries are required highly skilled process and many surgical procedures due to the diversity of human bones. It is complicated to make a precise conclusion while doing an orthopedic surgery. Therefore introducing a haptic interface to the orthopedic drill is very important to make an accurate and real-time decision. By this haptic adoption, it can be reduced unwanted damages around the bone such as tissues and other anatomic parts. The proposed haptic interface in this research gives the feeling of irregularities of the bone to the operator's fingertip. The objective of the research is to identify the bone profile, breakthrough of a bone fracture and transfer the discrimination among the bone profile to the surgeon's fingertip to make precise real-time decisions.

Parameters of the system were estimated with a hardware setup. Simulation and experimental results prove the feasibility of the concept.

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