World Academy of Science, Engineering and Technology
International Journal of Industrial and Manufacturing Engineering
Vol:18, No:12, 2024

Force Feedback Enabled Syringe for Aspiration and Biopsy

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Abstract : Biopsy or aspiration procedures are known to be complicated as they involve the penetration of a needle through human tissues, including vital organs. This research presents the design of a force sensor-guided device to be used with syringes and needles for aspiration and biopsy. The development of the device was aimed to help accomplish accurate needle placement and increase the performance of the surgeon in navigating the tool and tracking the target. Specifically, a prototype for a force-sensor embedded syringe has been created using 3D (3-Dimensional) modeling and printing techniques in which two different force sensors were used to provide significant force feedback to users during the operations when needles pernitrate different tissues. From the extensive tests using synthetic tissues, it is shown that the proposed syringe design has accomplished the desired accuracy, efficiency, repeatability, and effectiveness. Further development is desirable through usability tests.

Keywords : biopsy, syringe, force sensors, haptic feedback
Conference Title : ICIEM 2024 : International Conference on Industrial Engineering and Management
Conference Location : Honolulu, United States
Conference Dates : December 30-31, 2024