

Towards Real-time Intrahepatic Vessel Identification in Intraoperative Ultrasound-Guided Liver Surgery

Karl-Philippe Beaudet^{1,3}, Alexandros Karargyris^{1,2}, Sidaty El Hadramy^{2,3},
Stéphane Cotin^{2,3}, Jean-Paul Mazellier^{1,2}, Nicolas Padoy^{1,2}, and Juan
Verde^{1,2,3}

¹ IHU Strasbourg, Strasbourg, France

² University of Strasbourg, CNRS, INSERM, ICube, UMR7357, Strasbourg, France

³ Inria, Strasbourg, France

1 Supplementary Material

1.1 *Ex vivo* swine liver model

This section presents images of the *ex vivo* swine liver model. Figure 1 illustrates a humanized *ex vivo* swine liver within a stiff, US-compatible, gel-based scaffold. The tracked ultrasound probe, electromagnetic reference sensor of the liver box, and the field emitter of the electromagnetic system are also visible.



Fig. 1. Humanized *ex vivo* swine liver model within a stiff, US-compatible, gel-based scaffold

1.2 Surgeon's feedback form

This section provides the feedback form (see Figure 2) used to collect surgeons' feedback on the Intrahepatic Vessel Identification tool after validation experiments.

Clinical validation of the Intraoperative Vascular Structure Identification Tool

Dear Participant,

Thank you for participating in the clinical validation study of the intraoperative tool designed to assist surgeons in identifying vascular structures, specifically portal branches. Your feedback is valuable in assessing the effectiveness and usability of this tool.

Please rate your experience and perception on a scale of 1 to 5, where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree."

1. On a scale of 1 to 5, how effective was the intraoperative tool in assisting you with the identification of portal branches?
2. How confident did you feel in your ability to identify portal branches when using the tool? (1 - Not confident at all, 5 - Very confident)
3. On a scale of 1 to 5, how valuable would you expect the intraoperative tool to be in enhancing your surgical performance?
4. How would the tool integrate into your existing surgical workflow? (1 - Poor integration, 5 - Seamless integration)
5. Did the tool provide real-time feedback that was helpful for decision-making during the procedure? (1 - No helpful feedback, 5 - Highly helpful feedback)
6. How do you envision the potential use of this tool as an educational resource for training and skill development among surgeons? (1 - Not useful, 5 - Highly valuable)

Please feel free to add any additional comments or suggestions in the space provided below. Your input will help us improve the tool's performance and enhance surgical outcomes.

Additional Comments:

Fig. 2. Feedback form provided to surgeons after the experiments