Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Versuchsanstalt für Wasserbau,
Hydrologie und Glaziologie

Master's or Project Thesis HS 2021
Project Based Research Work

Examiner: Prof. Dr. Robert Boes
Supervision: Dr. Gabriel Spreitzer

Reconstructing 3D trajectories of logs in rivers using 9-DoF smart sensors

Large wood (LW) plays an important role in rivers, as it regulates stream power, protects stream bed from erosion and creates habitats for numerous living organisms. Besides all the benefits of wood in streams, there are also challenges and risks involved when large amounts of wood are mobilized and transported by the flow. LW in transit represents a great risk for river crossing infrastructure due to impacts and the formation of LW accumulations. To date little is known about LW transport dynamics as applicable sensing techniques have been limited. However, a better understanding of LW mobilization, transport and depositional processes is urgently needed in order to reduce the hazard potential for existing and future riverine infrastructure, but also to allow for LW in rivers as a naturally important element.

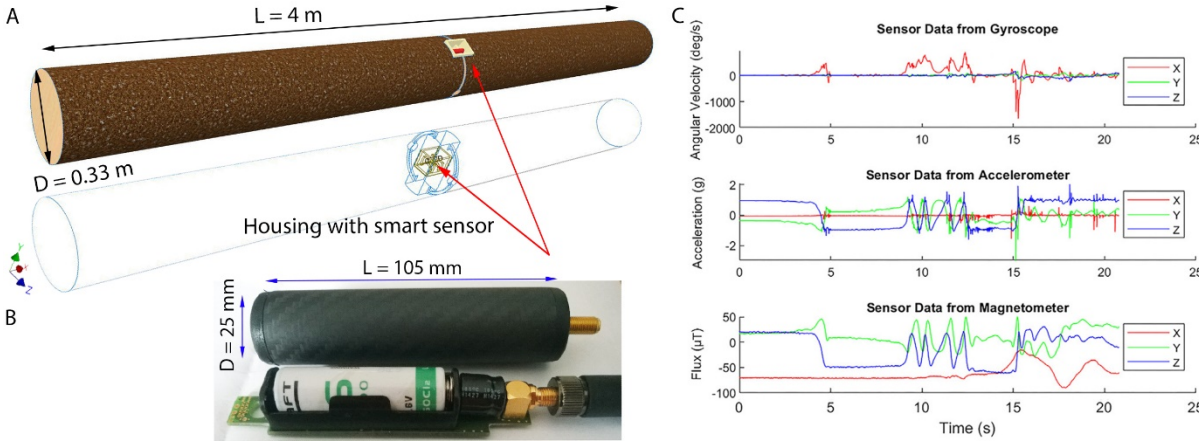

Fig. 1: SmartWood – Prototype wood logs (A), with an implanted smart sensor unit (B), providing high resolution data of large wood (LW) in transit.

The SmartWood_3D research project employs innovative nine-degree of freedom (9-DoF) smart sensors, implanted into real logs (Fig. 1A and B), which allow the capture of LW movement processes in rivers. Working with the acquired sensor data from gyroscope, accelerometer and magnetometer (Fig. 1C), represents the core of this project, as these data provide a rich source of information required for the quantification of movement dynamics such as log velocity or impact forces, but also for the reconstruction of the entire three-dimensional transport path of the logs. The gained results will be of use for river managers and engineers in order to better control for LW in rivers.

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Remarks:

Software: MATLAB or Python;
Single Master's thesis, or up to two project theses;
Project language: English or German