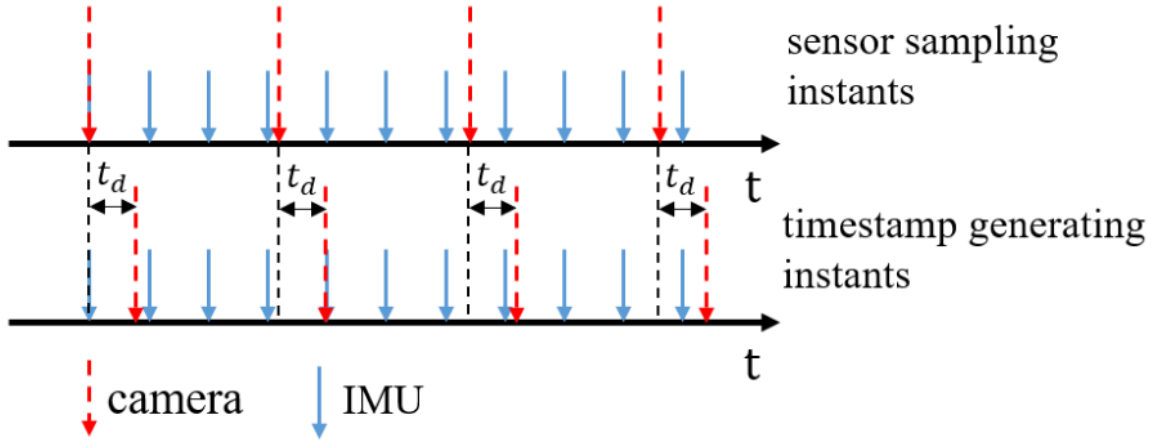
Investigating the effect of time synchronization in SLAM



Paper including figure: https://arxiv.org/pdf/1808.00692.pdf

Abstract: Multi-sensor fusion algorithms, like visual-inertial SLAM, fuse measurements from different sensors with the underlying assumption that these measurements are aligned with respect to some global clock. This alignment can be estimated either offline -during calibration- or online when the system is being used. Further, the alignment may be fixed with an offset (through propogation delays) or variable (through additional processing delays depending on the CPU load) with respect to the global clock leading to the underperformance of the SLAM algorithm due to the violated assumption. In this project the student will derive a model and evaluate how this synchronization affects the overall accuracy of the algorithm.

Tasks:

- Derive a model for how synchronization errors and propagation delays propagate through the SLAM algorithm and affects both the state estimation and the control of the robot
- Build a sensor payload for visual-inertial SLAM with tight control of synchronization and propagation delays.
- Evaluate model with experiments on a handheld sensor payload and an aerial robot in both lab (in a motion capture room) and field conditions.

Literature (indicative):

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