PFEIFER: A MATLAB Based Platform for Preprocessing and Autofiducializing Experimental Electrogram Recordings

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**Background:** Time signals recorded from experiments in cardiac electrophysiology require processing before further analysis and interpretation. Most labs create their own in-house software for such processing so there is a scarcity of openly available tools for this purpose, resulting in both an entrance barrier and a lack of common framework for comparing algorithms.

**Methods:** To process signals from electrophysiology experiments, we developed the Preprocessing Framework for Electrograms Intermittently Fiducialized from Experimental Recordings (PFEIFER), using MATLAB. Specific steps in PFEIFER allow the user to remove noise, correct signal drift, and mark specific instants or intervals in time (fiducialize) within all of the time sampled channels. PFEIFER includes many unique features for processing electrograms and electrocardiograms in a consistent and time efficient manner, all under the guidance of a graphical user interface. Within this open source framework, we also incorporated a novel, semi-automated “autofiducilizing” algorithm to detect and place fiducial markers across many beats within each acquired signal. This autofiducializing algorithm implements a cross-correlation technique to propagate an initial user selected fiducial marker throughout a sequence of subsequent beats. This system replaces manual fiducializing, reduces subjective bias, and greatly accelerates processing.

**Results:** PFEIFER allows the user to import time aligned cardiac electrograms and electrocardiograms, semi-automatically determine fiducial markings, and perform signal processing tasks that prepare the signals for subsequent display and analysis. Preliminary results of the autofiducializing algorithm show a strong agreement when comparing semi-automatically selected fiducials to fiducials selected by an expert user.

**Discussion:** PFEIFER is an open source MATLAB toolkit, which also enables users to modify and thus adapt/extend the software to suit specific needs or otherwise improve its utility. The autofiducializing algorithm and other interface features greatly reduce time and resources required to process experimental recordings