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Method for the automatic detection of calcium release events through image processing

A new system for automatic analysis of confocal microscopy images in cardiac cellular studies has been developed. The tool, developed by a group of engineers, clinicians and physiologists from UPC and CSIC, eases the automatic processing of imaging data at a cellular level, which currently requires laborious manual analysis. Partners to further develop the system and/or to establish commercial agreements along with technical cooperation are sought.

The Challenge

Calcium release events such as calcium sparks, puffs, or waves play an important role in many physiological processes. For instance, cardiac arrhythmia has been associated to increased local calcium release (calcium sparks) in isolated cardiac myocytes. Because of the physiological and clinical relevance of these phenomena, many studies are currently focused on improving the detection and characterization of these events.
Recent advances in confocal and fluorescence microscopy now allow studying the distribution and properties of local and global calcium release events. However, the analysis of experimental data requires tedious manual processing of long sequences of images. In order to overcome this problem, the research group has developed an automatic detection system that processes confocal microscopy images to analyze the experimental data faster and more accurately than manual procedures.

The Technology

The system is an image processing method that detects, localizes and characterizes both local and global calcium release events from a sequence of confocal microscopy images. The technique comprises a variety of image and signal processing methods such as wavelet analysis, adaptive filtering and pattern recognition. The technology is particularly suitable for monitoring intracellular calcium activity in cardiac myocytes, and could be extended to other areas using flourescence-imaging techniques. The performance of the method is significantly better than the manual analysis carried out by an expert and drastically reduces processing time.

Innovative advantages

- Allows distinction between local and global calcium release events
- Spatial and temporal event mapping
- High detection accuracy
- Short processing time
- Robustness to low signal-to-noise conditions
- Automated data analysis and batch processing

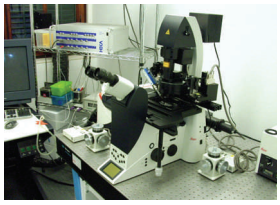
Current stage of development

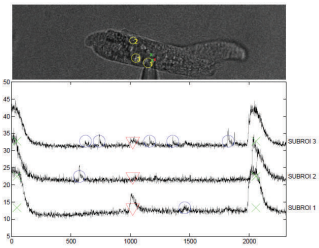
Ready and functionally operative for the study of calcium release events in cardiac myocytes. The potential in others fields, such as neuroscience, endocrinology, and immunology is being explored and tested.

Applications and Target Market

This technology represents a big improvement for the characterization of calcium release events and their potential involvement in pathology. Currently, the system allows studying single cardiac, nervous and pancreatic cells, but it is potentially applicable to cell culture studies.
A business opportunity for companies devoted to biomedical image processing, or to the design and manufacture of precision optical systems such as confocal or fluorescence microscopes.

New system for the automatic characterization of local calcium release events





Faster and more accurate than manual procedures

High detection accuracy

Short processing time
High robustness

Business Opportunity
Technology available for licensing with technical cooperation

Patent Status
PCT application

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