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Monitoring and Automatic Classification of Flying Insects

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We have developed prototype remote unattended optical instrumentation capable of automatically counting and classifying insects in flight. Neither acoustic or image based, the instrument uses a solar cell as an unconventional sensor to record rapid fluctuations in light intensity caused by the shadow or reflection of a flying insect. Digitized signals capture unique flight signatures containing rich spectral information allowing precise classification of the insects. The integrated technology is referred to as Flight Activity Signature Technology for Identification (FAST-ID). Preliminary investigations have shown the ability to unambiguously identify several species of aphids, moths, and mosquitoes (including sibling species and sex). Ongoing hardware device design and development will produce stand-alone units with embedded processing for automatic signature collection and long range wireless communication. A modular design will facilitate add-on components such as solar power or enhanced batteries, external IR lighting, and a suite of sensors that provide additional environmental information that will be tagged as metadata specific to each individual flight signature. Software research and development is focused on more robust algorithms designed for classification of a greater number of species or other taxonomic groupings, as well as automatic clustering of unknown species. Pest surveys, in agricultural, forestry and quarantine applications, are labor intensive and time consuming. FAST-ID will provide real-time, automated information about local pest populations allowing targeted and effective intervention operations.