The Cyborg Astrobiologist: Novelty Detection & Saliency Mapping for Landed Missions

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We will present an overview of the Cyborg Astrobiologist project since 2002, wherein we developed and tested several computer-vision algorithms for future use in landed missions to Mars and the astrobiologically-interesting moons of our solar system. These three real-time computer-vision algorithms focus on two different problems: (1) uncommon mapping or saliency mapping for single images or single image mosaics of geological/astrobiological scenery in color or texture space, and (2) novelty detection in a sequence of images, also in color or texture space. These three algorithms have been tested at field sites in Spain, Malta, Utah, and West Virginia with a wearable computer system and with a mobile phone-cam system, and have successfully detected wet areas of gypsum outcrops and various lichens as either uncommon/salient or novel. Future work includes further field testing at astrobiological field sites, further testing with proxy data from current/past landed planetary/lunar missions, and further enhancements in software speed.