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Autonomous sample selection and acquisition for planetary exploration

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Thanks to rapid advances in planetary robotics and scientific instruments, data can now be gathered on the surface of Mars far quicker than can be successfully relayed to Earth. Pauses in activity have to be introduced, so that this additional data can be transmitted back to Earth. These pauses represent an inefficiency in the overall mission value, as value is calculated by dividing the amount of useful scientific data returned by the cost. Scientific data with little value represents a waste of valuable transmission time and thus reduces the overall cost efficiency of the mission. Pauses in activity also have to be introduced during periods when communication with Earth is impossible. A great deal of research is currently being undertaken to try to limit this time wastage through the utilization of an autonomous sample selection and acquisition system. Such a system could initially select high value science targets and then continue its exploration while only useful data is being relayed to Earth for further study, thus increasing mission value. This paper will present a review of the research currently being undertaken to aid in producing an autonomous sample selection and acquisition system for planetary exploration.