

# DEVELOPMENT OF A WEB-BASED GEOGRAPHIC INFORMATION SYSTEM FOR PLANETARY GEOLOGICAL MISSION PLANNING AND ANALYSIS

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*Several announcements in recent years by the United States and Canadian governments featuring their space exploration plan have one major thing in common: mission preparation at terrestrial analogue sites. Mission simulations carried out at these sites often involve traverses that allow access to areas of special interest needed to meet mission's objectives. Despite many recommendations, no WEB-based geographic information system exists for terrestrial analogues for mission planning.*

*This paper reports the development of a WEB-based geographic information system for terrestrial analogues, illustrated using the example of the Haughton impact crater analogue site. This system demonstrates functionality that provides users with tools to plan their missions by enabling traverse planning between areas of interest based on a least cost path analysis method. The geographic information system will be composed of open source libraries and software, and will be compliant with Open GeoSpatial Consortium standards.*

*Plusieurs annonces faites récemment par les gouvernements américain et canadien au sujet de leur plan d'exploration spatiale ont un élément important en commun : la préparation sur des sites analogues terrestres. Les missions préparatoires effectuées sur ces sites comportent plusieurs traverses, afin de se rendre à chacun des sites d'intérêt. Malgré plusieurs recommandations, il n'existe aucun système d'information géographique sur le WEB portant sur ces sites et permettant une planification de telles missions.*

*Cet article porte sur le développement d'un système d'information géographique sur le WEB ayant comme région d'étude un site analogue terrestre, soit le cratère d'impact Haughton. L'outil proposera aux utilisateurs de planifier leur mission en leur permettant de créer des traverses allant entre chaque point d'intérêt selon la méthode d'analyse du chemin de moindre coût. Enfin, le système d'information géographique sera composé de logiciels et librairies libres tout en respectant les normes de l'Open GeoSpatial Consortium.*

## Introduction

Several announcements and reports made in recent years by the Canadian and American governments about their respective exploration space plans have an important element in common: mission preparation on terrestrial sites [Bush 2004; Berinstain et al. 2006; Augustine et al. 2009; CSEW6 Steering Committee 2009; SPACE 2010]. Terrestrial analogues are adequate environments for this type of activity, because they possess presumed geological, environmental or biological conditions of an actual or passed celestial body [Osinski 2006]. Canada is involved in space exploration in fields such as astrobiology, planetary geology and geophysics, and advanced life support [CSEW6 Steering Committee 2009].

Extravehicular activities (EVAs) are a key element of human missions to planetary surfaces. These typically have predetermined operations or

science objectives that can be addressed at carefully chosen terrestrial analogues in order to develop a detailed protocol for a particular task, test systems, or train the astronaut, before undertaking the task on the Moon or Mars. Some EVAs require the planning of long and complex traverses to go to different pre-selected areas of interest called stations, identified through an extensive review of earlier mission data sets. A scientific traverse is the path taken by scientists, robots or astronauts to go through all stations in order to complete missions or EVAs objectives. Traverses are a good example of a planetary mission activity that can be simulated at a terrestrial analogue site. To plan and optimize missions, and more precisely EVAs, geographic information systems (GIS) have been developed in order to create optimal traverses [Essenburg 2008; Marquez 2007 and



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