

# OCCUPY MARS via Online Evolution

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*Keywords:*

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## 1. Introduction

Successful colonization of Mars will be aided by Autonomous Robots (AR) who can independently learn while creating habitable conditions. AR will negotiate environments their designers did not anticipate. Most Evolutionary Algorithms (EA) research can be characterized “as training phase,” or **offline evolution**. This research can be leveraged to create “lifelong adaption via evolution,” or **online evolution**. The purpose of this discussion is to both introduce online evolution as a solution to colonizing and introduce existing EA that aid this effort, and identify where further efforts are needed.

## 2. Aim

To identify areas where we need to improve existing EA to meet the challenges of a physical world; that is, beyond the realm of computer models.

## 3. Material and methods

Simple, calendric robot with two wheel, three led lights, a camera, and a gyroscope

## 4. Results

No two LED lights on a given robot are the same creating problems

Robots traveling to a location can take several minutes

An unfavorable fitness landscape that destroys the robot introduces a new range of problems. For example, EA offers a solution to the Traveling Sales Problem. For these problems, the worst outcome is wasted time.

## 5. Conclusions

Among the limits of existing EA: Noisy Fitness, Costly fitness, and a complicated Fitness Landscape.

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## **6. Keywords**

Evolutionary Algorithms, Genetic Algorithms, Mars, Automated Robots, Online Evolution, Offline Evolution

## **Author biography**

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