

# Assignment 3-AI

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**Moravec's paradox**

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## 1 Introduction

Moravec's paradox is the observation by artificial intelligence and robotics researchers that, contrary to traditional assumptions, reasoning requires very little computation, but sensorimotor skills require enormous computational resources.

## 2 The biological basis of human skills

One possible explanation of the paradox, offered by Moravec, is based on evolution. All human skills are implemented biologically, using machinery designed by the process of natural selection.

### **As Moravec writes:**

Encoded in the large, highly evolved sensory and motor portions of the human brain is a billion years of experience about the nature of the world and how to survive in it. The deliberate process we call reasoning is, I believe, the thinnest veneer of human thought, effective only because it is supported by this much older and much more powerful, though usually unconscious, sensorimotor knowledge. We are all prodigious olympians in perceptual and motor areas, so good that we make the difficult look easy. Abstract thought, though, is a new trick, perhaps less than 100 thousand years old. We have not yet mastered it. It is not all that intrinsically difficult; it just seems so when we do it.

### **A compact way to express this argument would be:**

- We should expect the difficulty of reverse-engineering any human skill to be roughly proportional to the amount of time that skill has been evolving in animals.
- The oldest human skills are largely unconscious and so appear to us to be effortless.
- Therefore, we should expect skills that appear effortless to be difficult to reverse-engineer, but skills that require effort may not necessarily be difficult to engineer at all.

### **3 Historical influence on artificial intelligence**

Rodney Brooks explains that, according to early AI research, intelligence was "best characterized as the things that highly educated male scientists found challenging", such as chess, symbolic integration, proving mathematical theorems and solving complicated word algebra problems.

This would lead Brooks to pursue a new direction in artificial intelligence and robotics research. He decided to build intelligent machines that had "No cognition. Just sensing and action. That is all I would build and completely leave out what traditionally was thought of as the intelligence of artificial intelligence." This new direction, which he called "Nouvelle AI" was highly influential on robotics research and AI.