

Introduction

1.1 Machine Intelligence on the Road

Our society is awash in “machine intelligence” of various kinds, from smart thermostats in our homes, to expert systems and design aids in our workplaces, to jet aircraft landing safely in treacherous weather under computer control. Over the last century, we have witnessed more and more of the “drudgery” of daily living being replaced by devices such as washing machines, microwave ovens, motorized transport, and the enhanced productivity and convenience offered by personal computers and information technology.

Over this period the hazards to our well-being have been greatly reduced, as well—medical technology can detect cancers and other diseases earlier and treat them better; buildings have become less susceptible to fire; floods are much less frequent; and travel is safer in general.

In essence, therefore, much of our technological progress has been focused on lessening the occurrence of unexpected and traumatic death and injury and protecting our physical assets.

One remaining area of both drudgery and danger, however, is the daily act of driving automobiles. Every moment of our time traveling the roads, we are exposed to the dangers of poor road conditions, other drivers whose skill or judgment we may question (!), and even our own fatigue or lapses of attention. In fact, the drudgery of the typical driving experience is liable to lead to these lapses of attention, as the act of driving in normal conditions places only a very modest cognitive load on the brain—leading us to be less responsive to the unexpected conditions that cause crashes. Driver error is the main cause of the vast majority of crashes, with roughly half of these instances due to delays in recognition. Thankfully, we are better protected when a crash occurs due to advances in vehicle crashworthiness and occupant protection—yet any crash is a traumatic experience, and we would certainly prefer to avoid them completely.