

Fast, Safe, and Proactive Runtime Planning and Control of Autonomous
Ground Vehicles in Changing Environments
(Technical Report)

Creativity and Legitimacy in Artificially Generated Art
(STS Research Paper)

An Undergraduate Thesis Portfolio
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by

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Preface

Computers typically execute lists of programmed instructions, but in deep machine learning, computers bypass such instructions to self-optimize and develop their own rules consistent with human-prescribed goals. Computer interpretation of unstructured data has applications in numerous fields, including autonomous navigation and algorithmic art. In situations with well-defined goals, such as vehicle navigation, machine learning can support systems that perform well in novel scenarios. In situations with subjective and complex goals, unsupervised deep learning can solve human problems without direct human input.

Unmanned ground vehicles (UGVs) traversing paths in complex environments may have to adapt to changing terrain characteristics, including different friction, inclines, and obstacle configurations. To maintain safety, a UGV must adjust its speed based on run-time predictions of future states. We present a neural-network based framework for the proactive planning and control of an autonomous mobile robot navigating through unknown terrain. In our approach, the UGV continually monitors its environment and the planned path ahead to safely navigate toward a desired goal. Additionally, we introduce random noise into the network to model sensor uncertainty and reduce the risk of predicting unsafe speeds.

Recent breakthroughs in artificial intelligence have led tech enthusiasts to promote the legitimacy of AI-generated art. Increasingly powerful computational tools are gaining acceptance among artists and art critics, but they have mixed feelings. Some see AI as a more powerful tool and artistic collaborator, while others contend that computers will soon be artists themselves. This raises questions about the nature of art and creativity and whether creativity resides in computers or the artists that program them. Previous artistic programs relied on humans, but new artists seek to transcend human intervention.

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