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LEARNING TO FLY: DEVELOPING AN AUTONOMOUS AERIAL VEHICLE USING HUMAN SKILL MODELING

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In recent years much work has been done in the area of abstracting computational models of human control strategies. This type of modeling has been used successfully to create autonomous ground vehicles from observation of human drivers, both in simulation and on real roads. Little work has been done, however, in attempting such skill transfer from human pilots to autonomous aerial vehicles.

In this project a robotic airplane has been developed as a platform for studying human-to-machine skill transfer in aerial vehicles. This platform is capable of recording the control actions of a human pilot along with data from onboard sensors. These data have then been used to develop models of the human pilot's control strategies which will enable the airplane to fly autonomously.

The general scheme followed in developing a model of pilot control schemes is as follows: (1) Data representing the human control inputs are collected, along with sensor

data representing the state of the system at that point in time; (2) After preprocessing, this data is used to train a cascade neural network; (3) The trained network is then used as an autonomous controller.

At the time of this writing, the basic platform has been completed and an electronics suite sufficient for initial experiments has been integrated into the platform. Initial experiments have shown that, using the method described in this paper, a model can be created which accurately predicts the next command of the human pilot given past command and current and past sensor data. Additionally, the software and hardware necessary to proceed with the next set of experiments--flying autonomously--has been completed.