Real Time Operating System (RTOS) for Embedded Controls

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Abstract: An important aspect of control algorithms is guaranteeing consistent timing. Sensor measurements, filtering, and control algorithms need to occur at consistent timesteps to function as intended. When low-level controls are implemented on embedded systems such as microcontrollers, deadlines for time-sensitive functions are not easy to guarantee or enforce. This project examines the use of Texas Instrument's Real Time Operating System (RTOS) to execute tasks with a guarantee of meeting deadlines. While the use of an RTOS kernel increases program footprint and execution overhead, it provides a scheduler to balance task priorities and powerful tools to evaluate thread latencies. Additionally, the RTOS kernel enforces hierarchies of threads, allowing high-priority tasks to interrupt less important ones. RTOS logging tools capture thread timestamps for latency validation. This project is exploring and verifying the effectiveness of an RTOS-based force-feedback controller for an actuator. It is thought that the use of an RTOS kernel provides confidence about software tasks performance that provide surety for predictable controller functioning.