6.111 Final Project Design

World Domination

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Introduction: Mechanical Structure

- 64 LEDs per Arc
- Atmosphere Arc updated with live weather data
- Operating Range between 1200-3600 rpm.
- Plexiglass shell (not depicted)
Top Level Design

(Decoder not depicted)
Module: RS232

- Actively writes to RAM when Map Module is inactive
- RS232 Data stored in internal buffer until it can be processed.
- Active for Cloud Arc
- Inactive for World Arc
Module: Encoder/Decoder

- Links the mechanical assembly with the lab kit(s)
- 60 Hz, 128 LEDs $\rightarrow$ $\sim$1 Mbps data transfer rate
- Asynchronous serial protocol
- Receives start signal from Timing Module
- Encodes LED control signal from Map Module
Module: LED “Controller”

- 8 Darlington arrays
- 8 Inverting latch arrays
- 2 PALs
- 3 Input pins per Arc
Module: Memory Controller/Mapping

- Orthographic projection
- Memory usage ~ 8Kb
- Receives theta & phi, outputs LED signals (off/on)

Images taken from <http://www.fes.uwaterloo.ca/crs/geog165/cylproj.htm>
Module: Timing FSM

- **Theta Timer**: counts down from `theta_period` and pulses start
- **Theta Counter**: `theta_period` = (# clock periods in last revolution) / `theta_select` w/ accuracy correction
- Inputs: `sync_pulse`, `clk`, `theta_period`, `theta_select`