Real-Time Embedded Systems

CpE-450 Spring 06

Class 12

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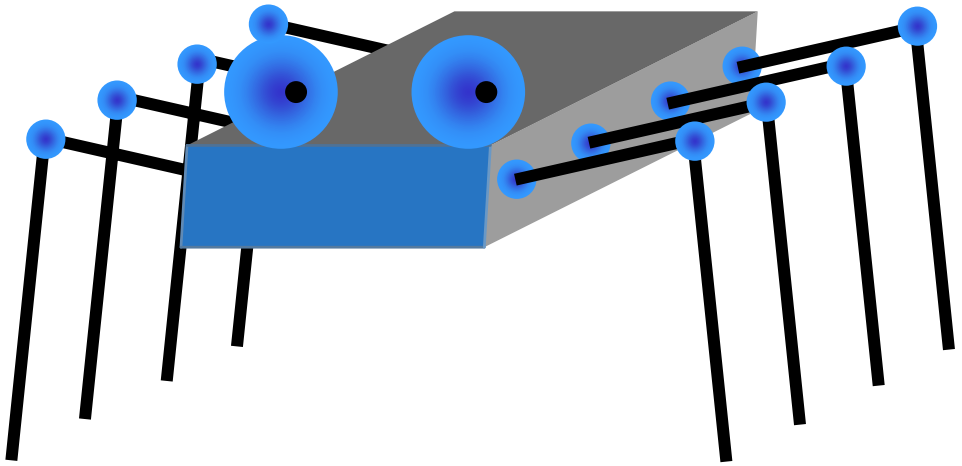
Case Study 3:
Serial Servo Controller

- Michael Dvorsky, “Low-Cost Serial Servo Controller,” *Circuit Cellar* 188, March 2006.
- ftp://ftp.circuitcellar.com/pub/Circuit_Cellar/2006/188/Dvorsky-188.zip

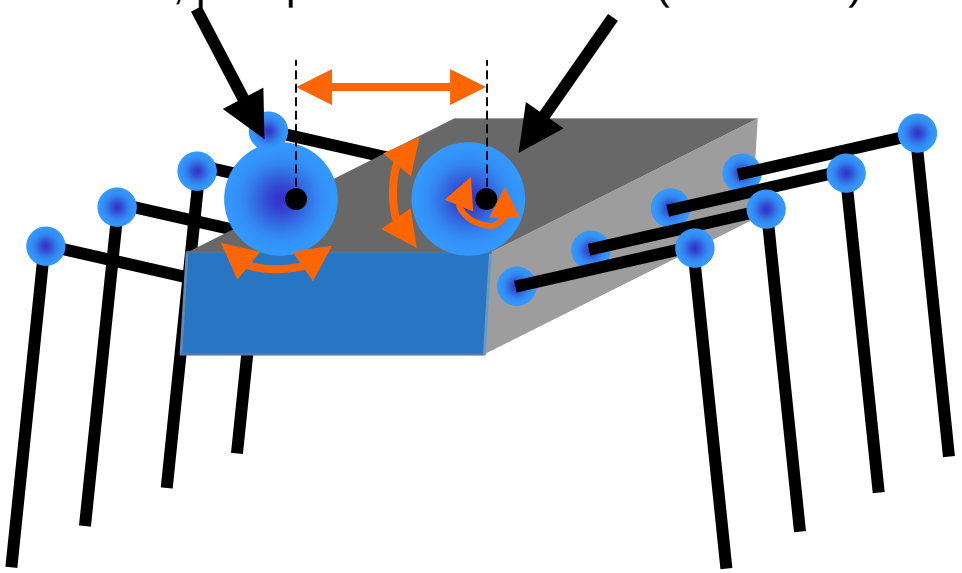
Hexapod/Octopod Actuators



- 6 legged creatures are inherently stable, but must remain balanced
- 8 legged creatures can be designed to be unconditionally stable
- Legs work on more surfaces than wheels do

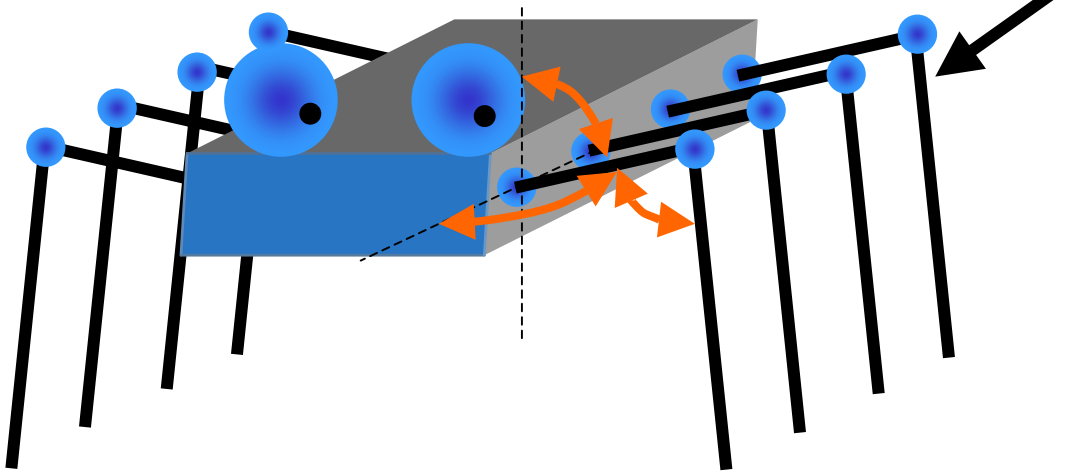
Hexapod/Octopod Actuators

Tilt & swivel, plus parallelism & focus (2 - 4 DoF)



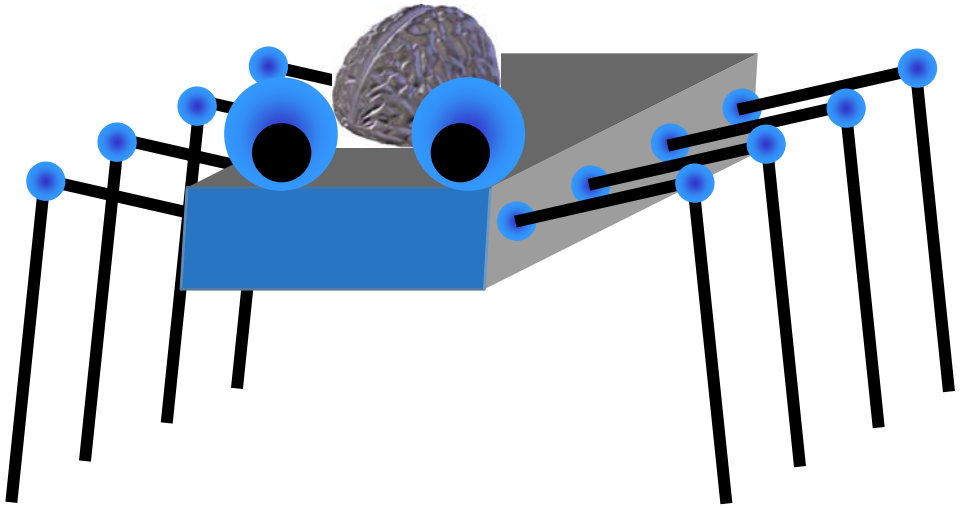
- Two visual systems allow stereoscopic vision, but require one more degree of freedom
- Focus adds another DoF

Hexapod/Octopod Actuators



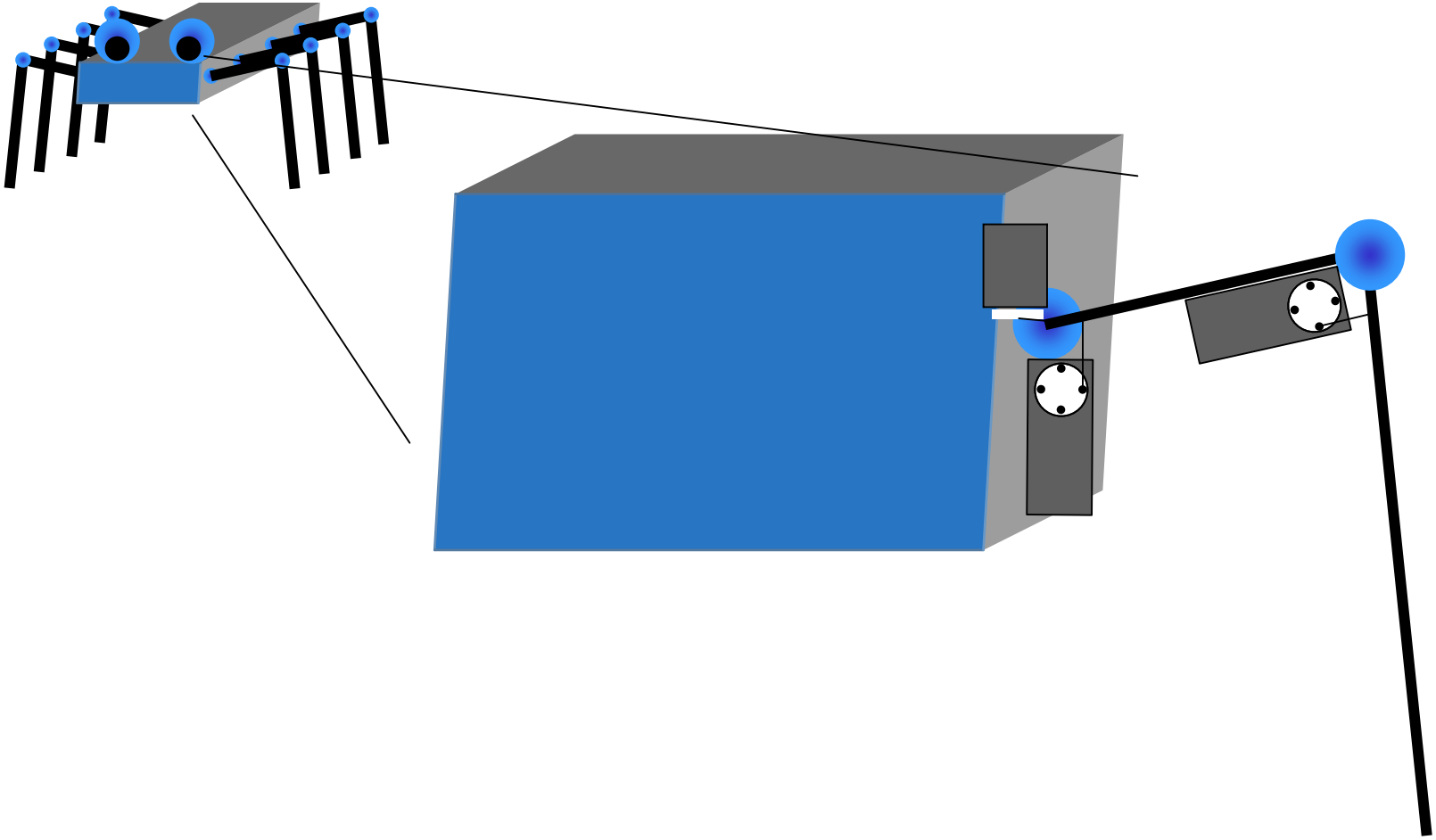
- “Knees” require one DoF
- “Hips” require two DoF

Hexapod/Octopod Actuators

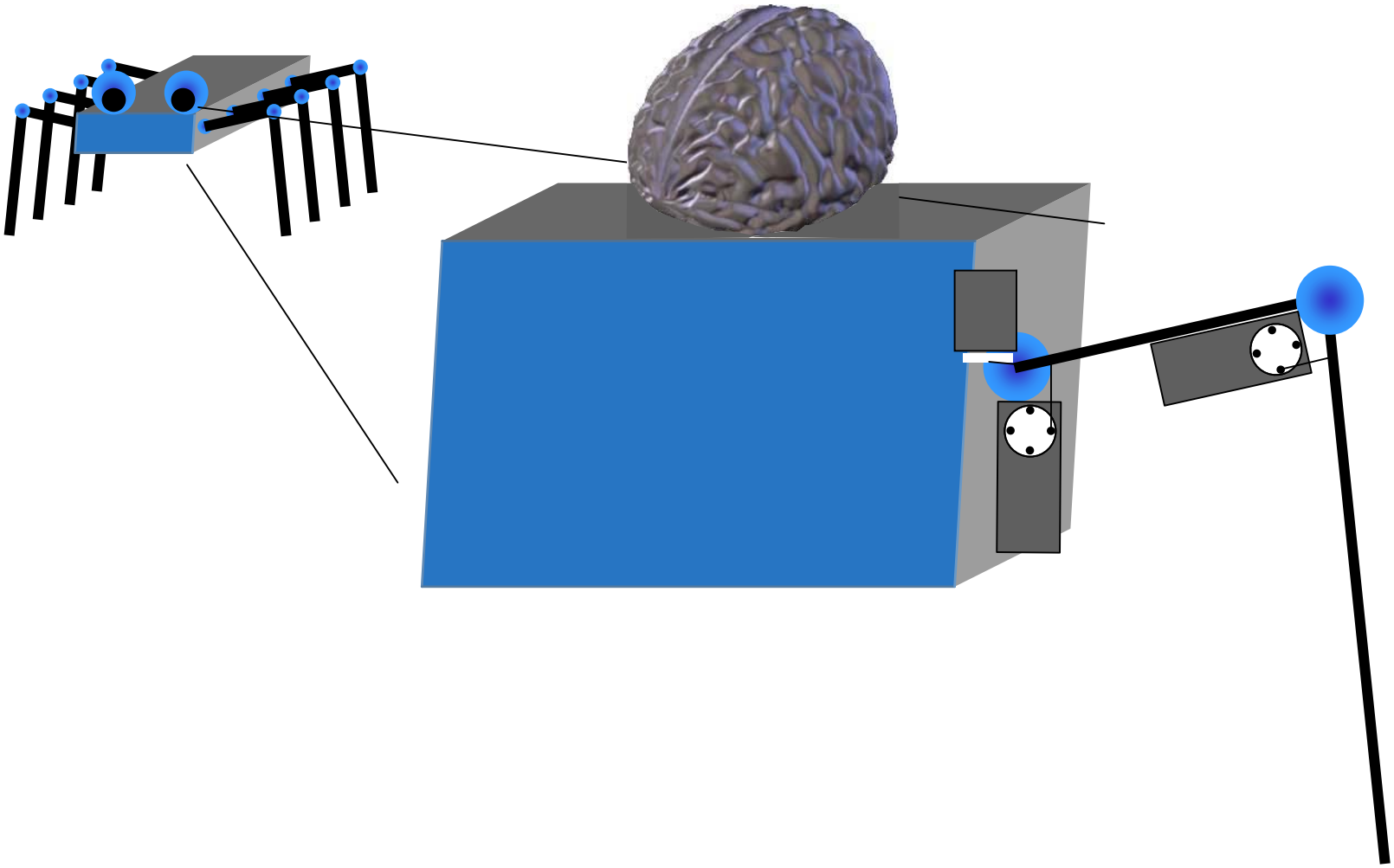


2 to 4 vision controllers
6 to 8 appendages ➔ 18 to 24 controllers
20 to 28 controllers

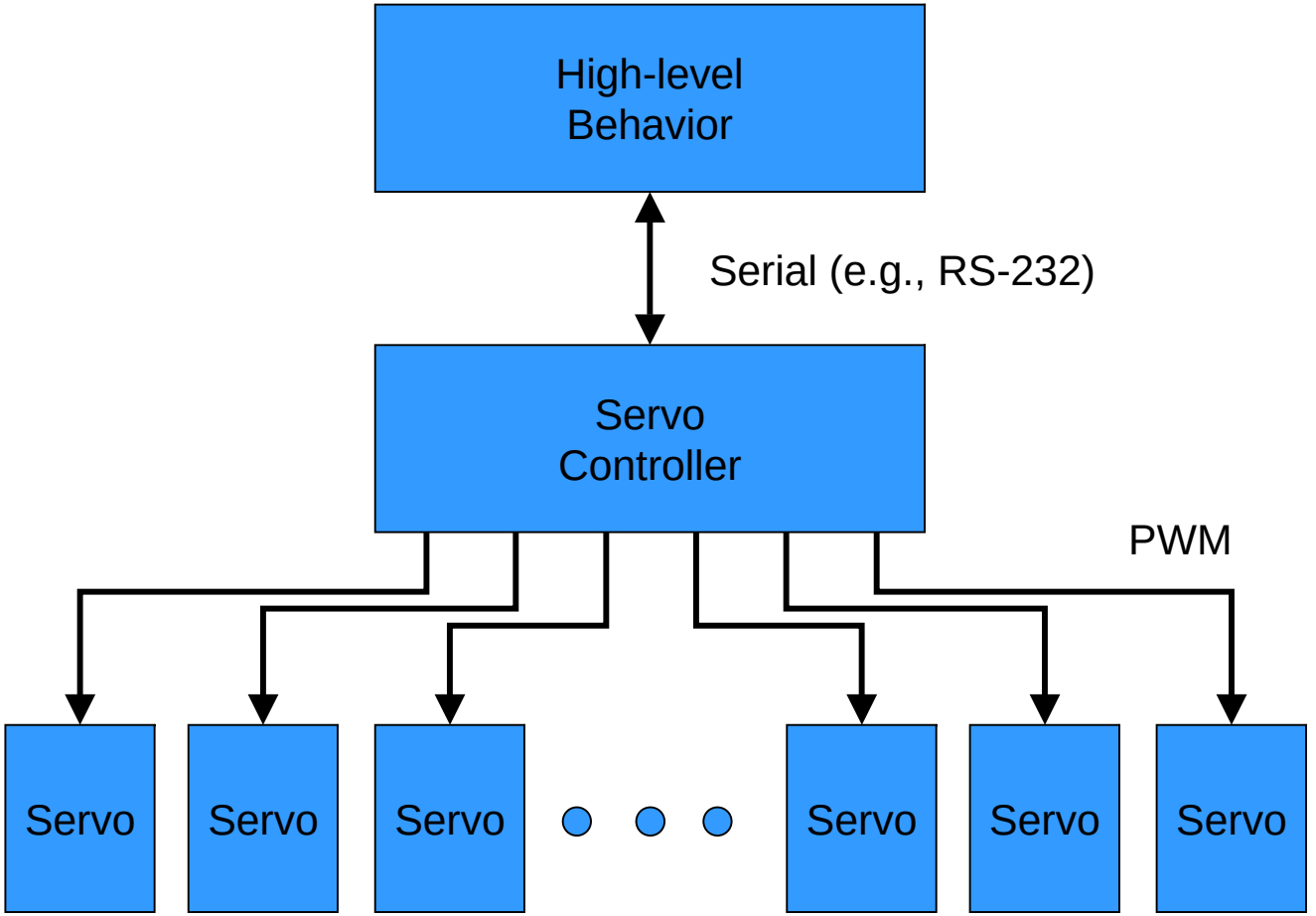
Hexapod/Octopod Actuators



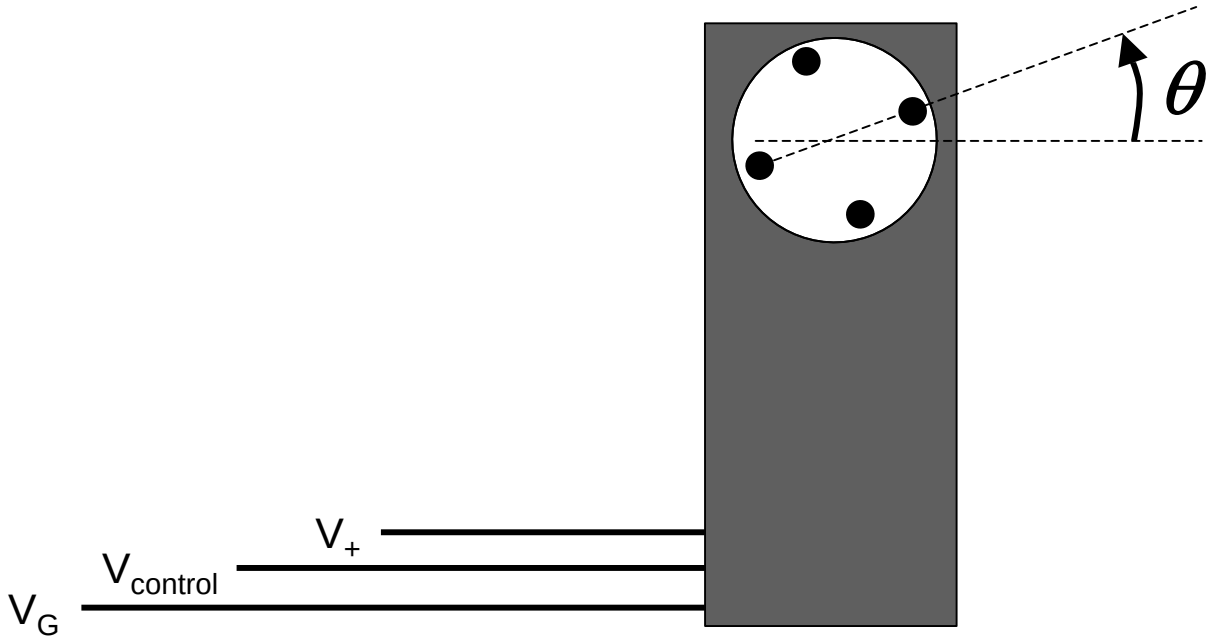
Hexapod/Octopod Actuators/Controller

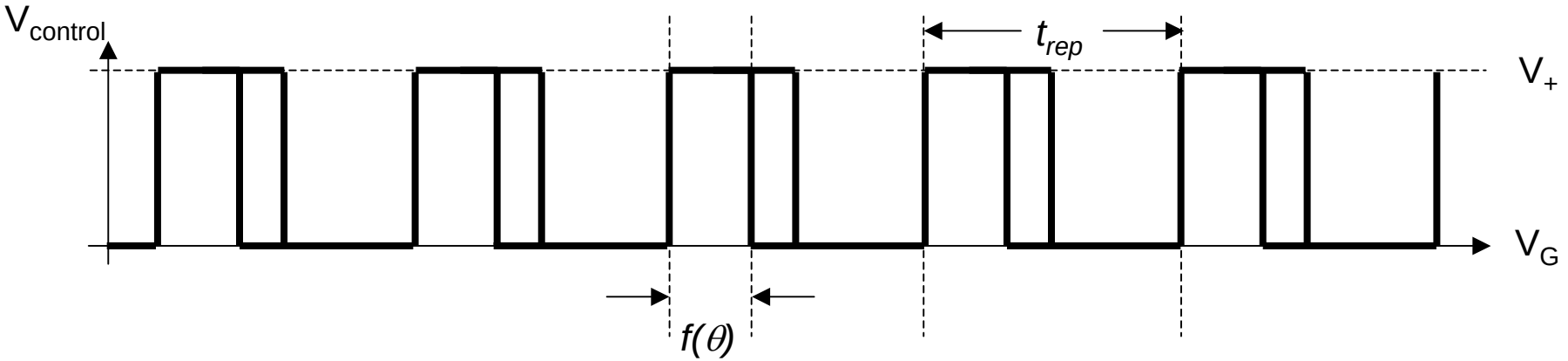


Distributed Control

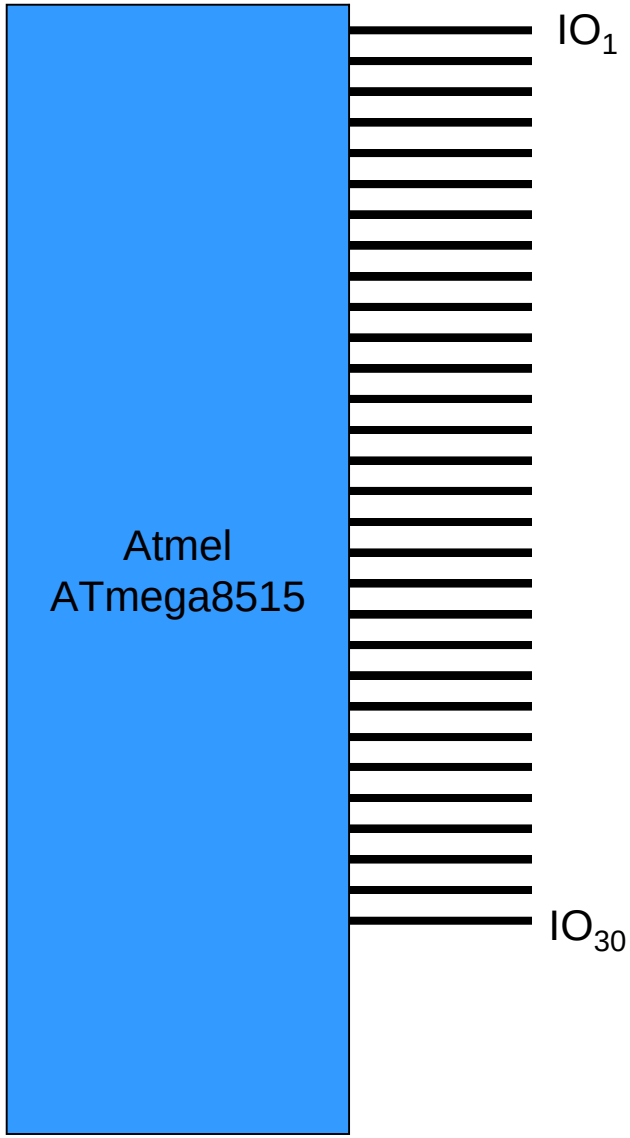


Servo Operation

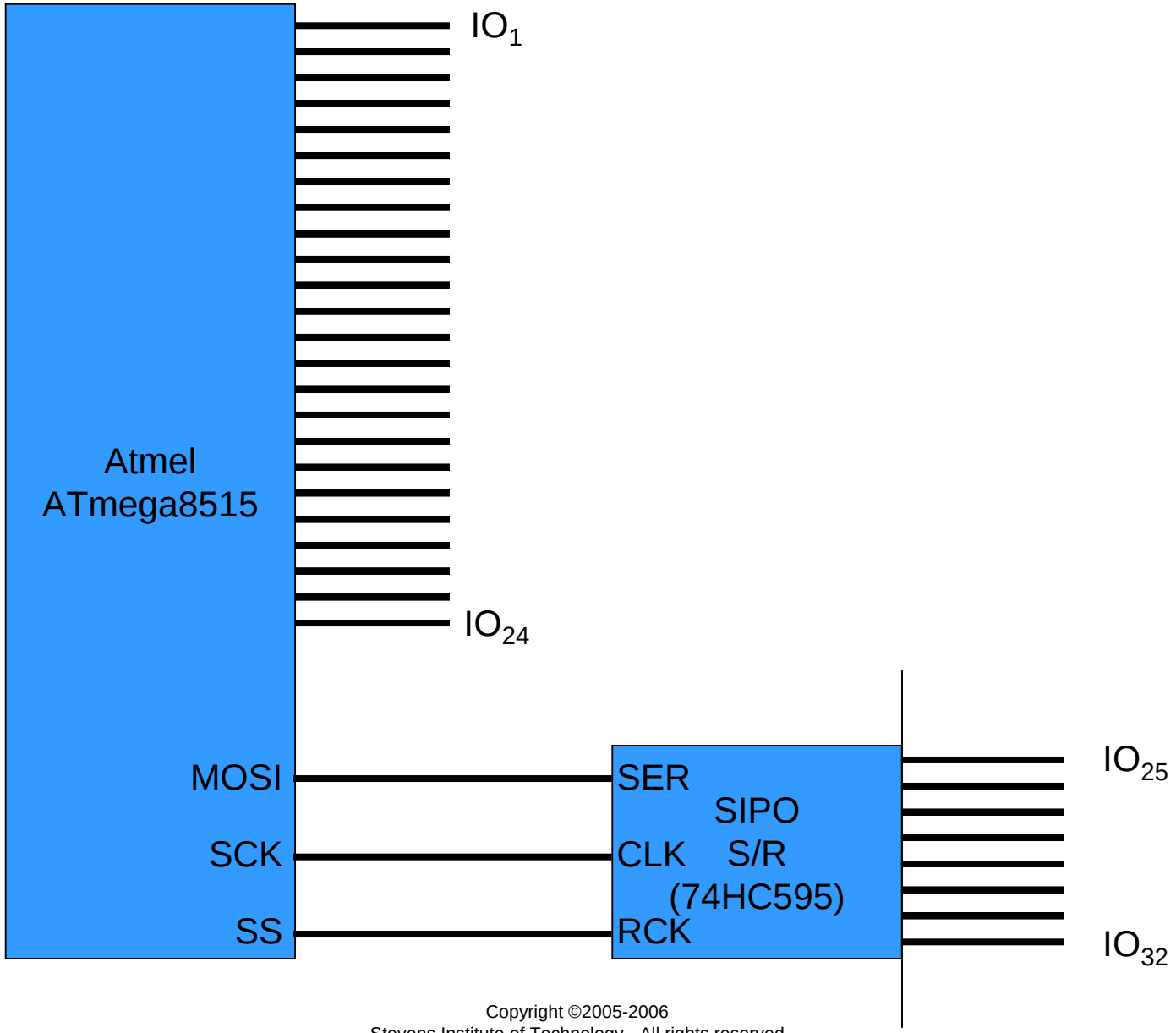




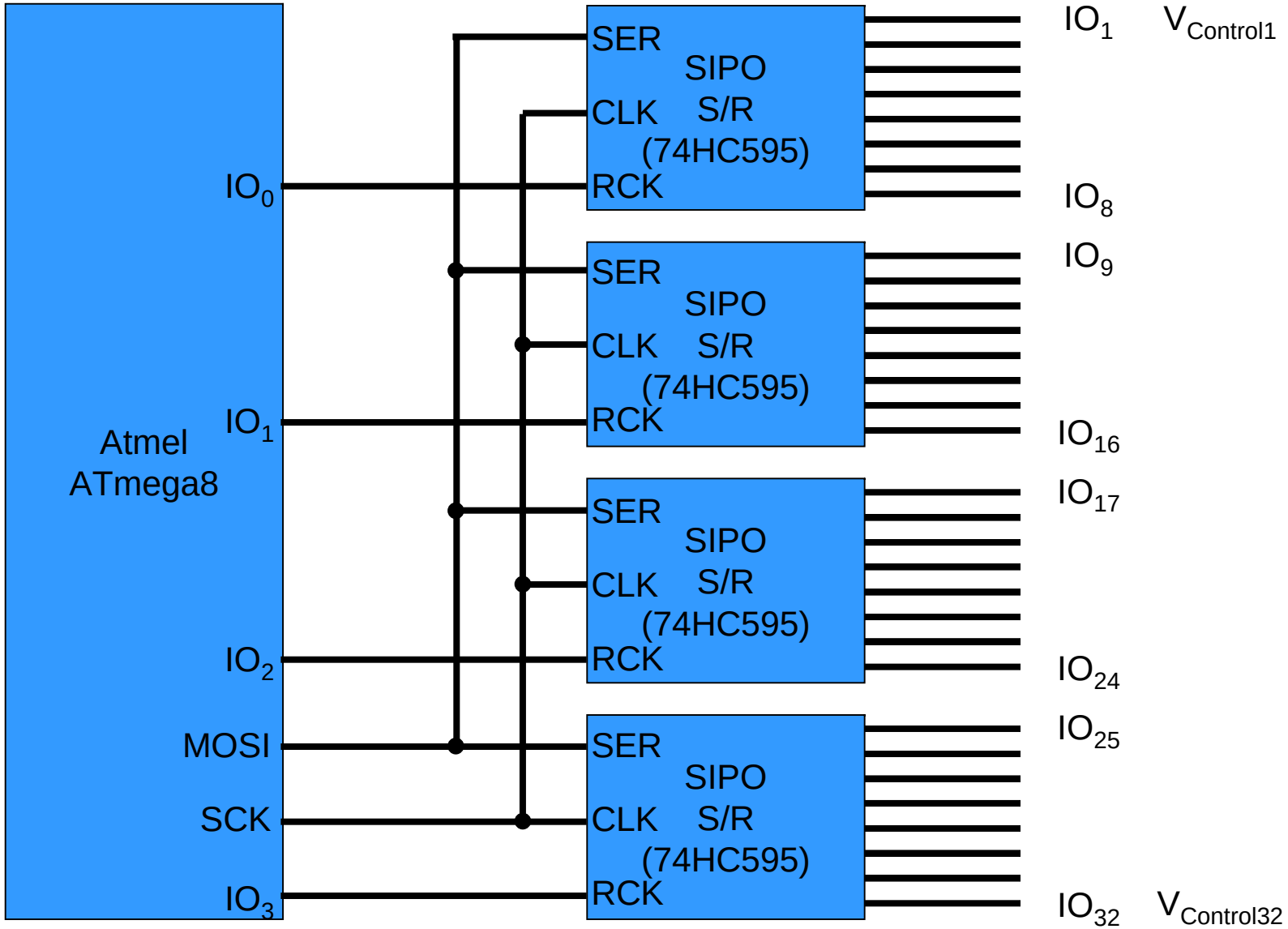
Servo Controller Options



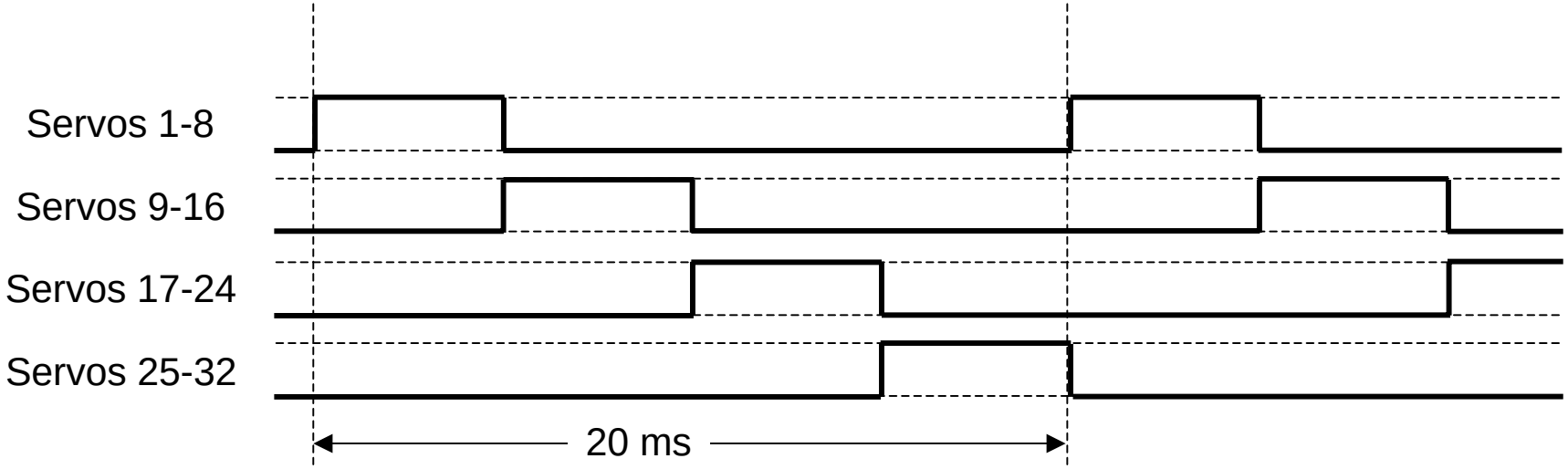
Servo Controller Options



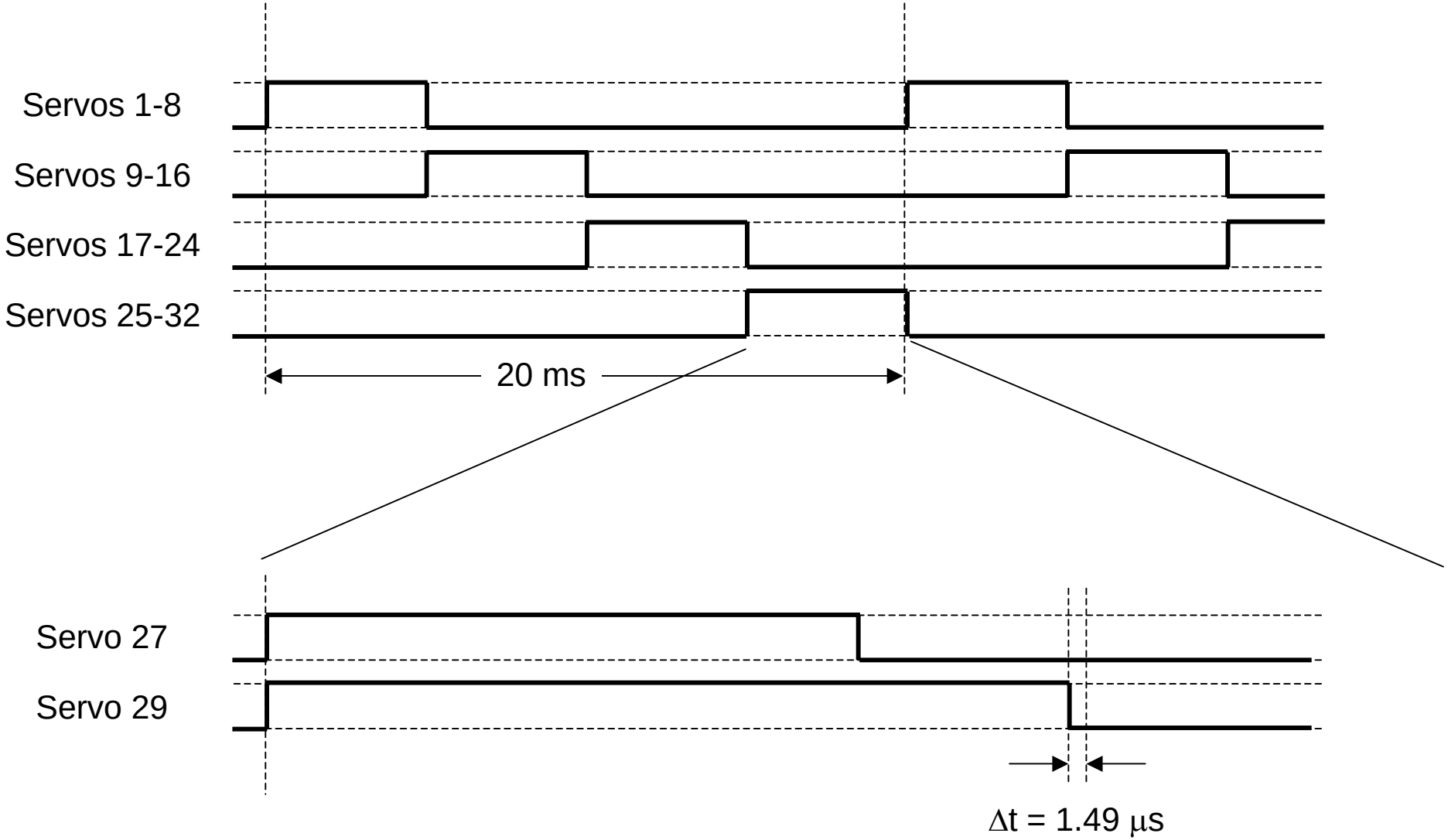
Servo Controller Options



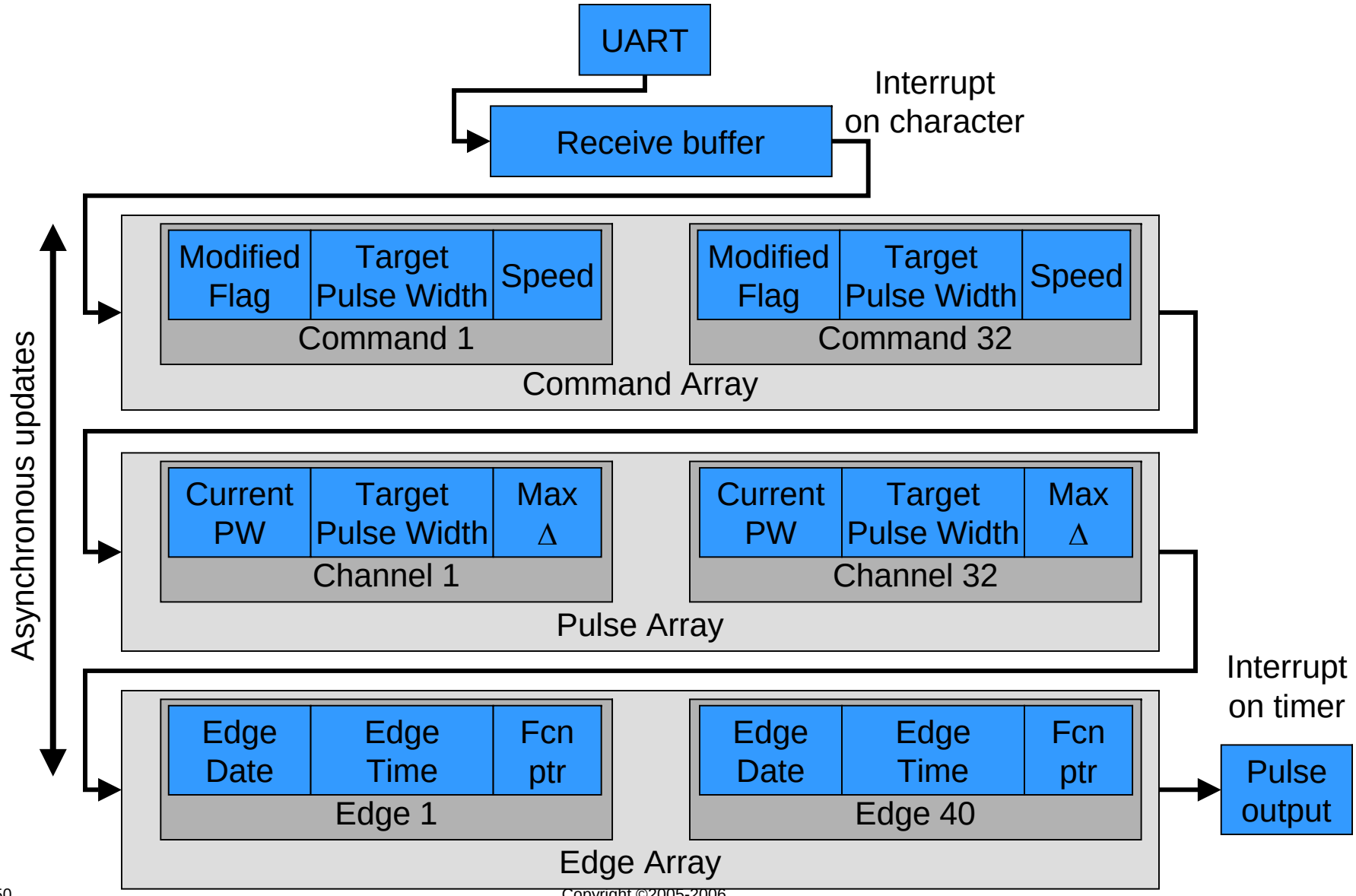
Pulse Timing



Pulse Timing



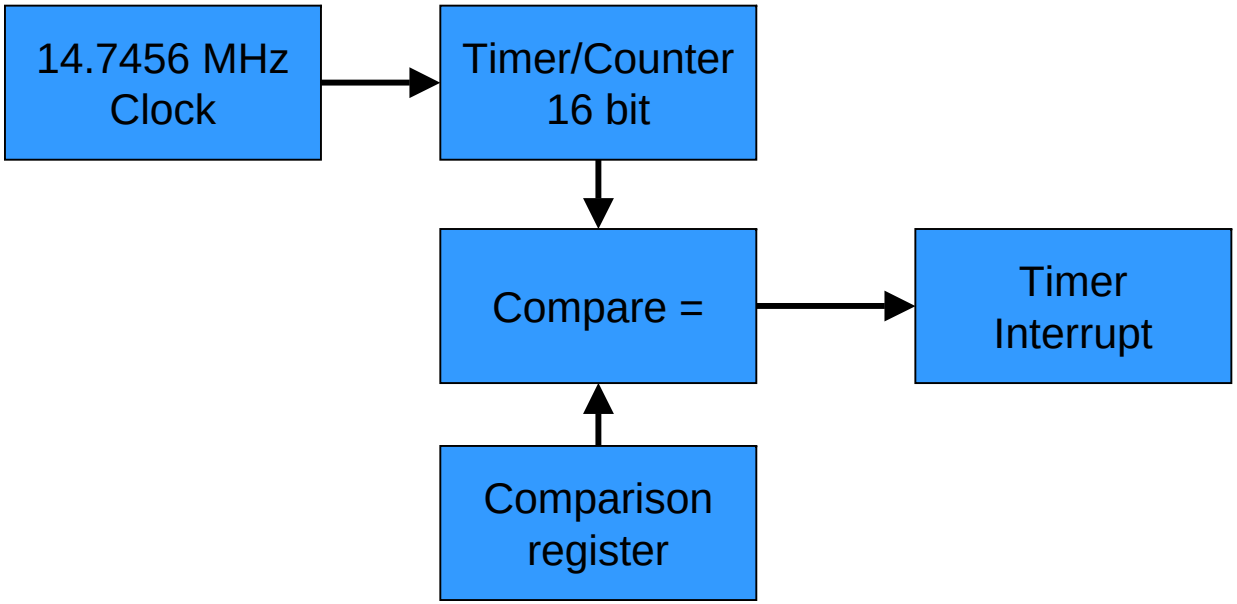
Pulse Control Data Flow



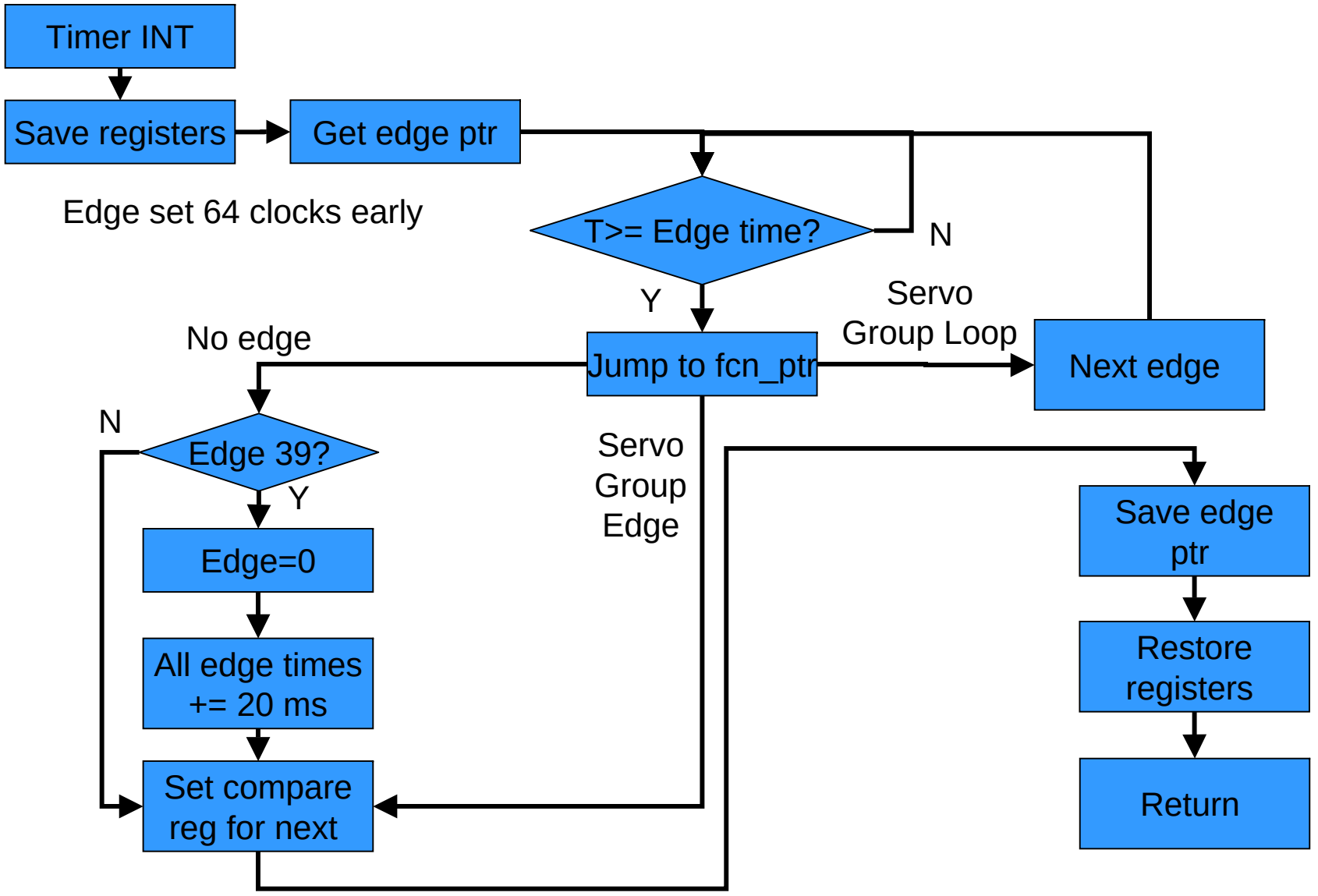
Pulse Generation

```
.
.
for (element:=0;element<=N_pulse_array;element++)
    {
    if(current_PW < target_PW)
        {
        current_PW += max_delta;
        if(current_PW > target_PW)
            current_PW = target_PW;
        }
        else
            {
            current_PW -= max_delta;
            if(current_PW < target_PW)
                current_PW = target_PW;
            }
    }
.
.
.
```

Pulse Timing



Timer ISR



Homework #9

- Project due next week