

Real-Time Embedded Systems

CpE-450 Spring 07

Class 11

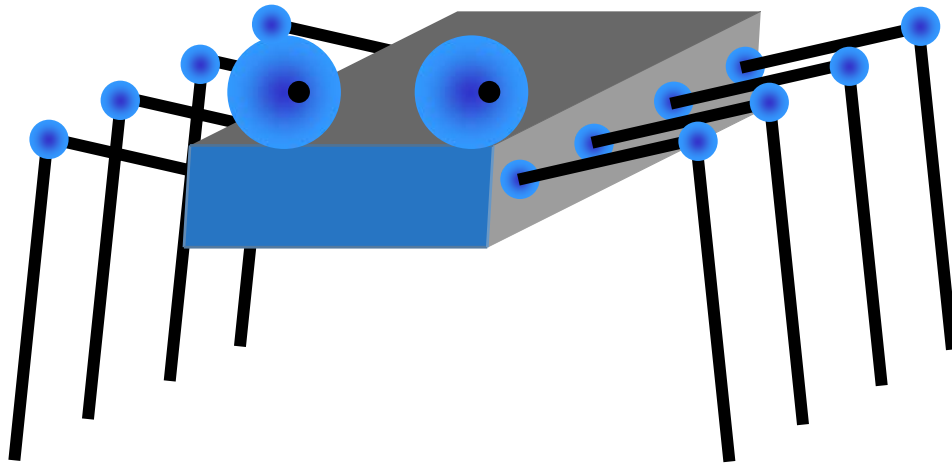
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Case Study 2: Serial Servo Controller

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

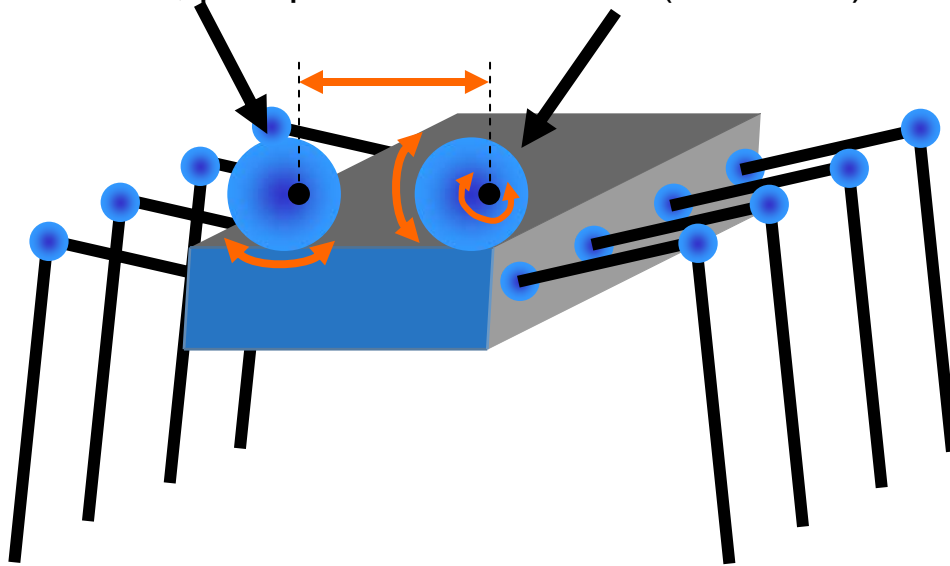
Hexapod/Octopod Actuators



- 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

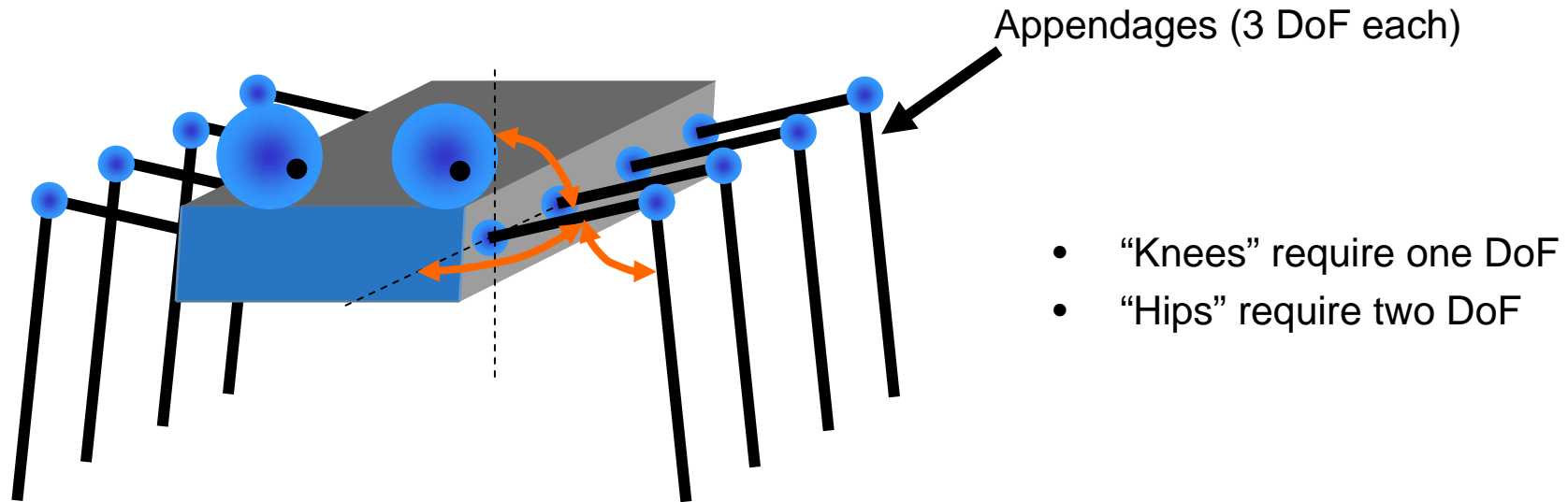
Hexapod/Octopod Actuators

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

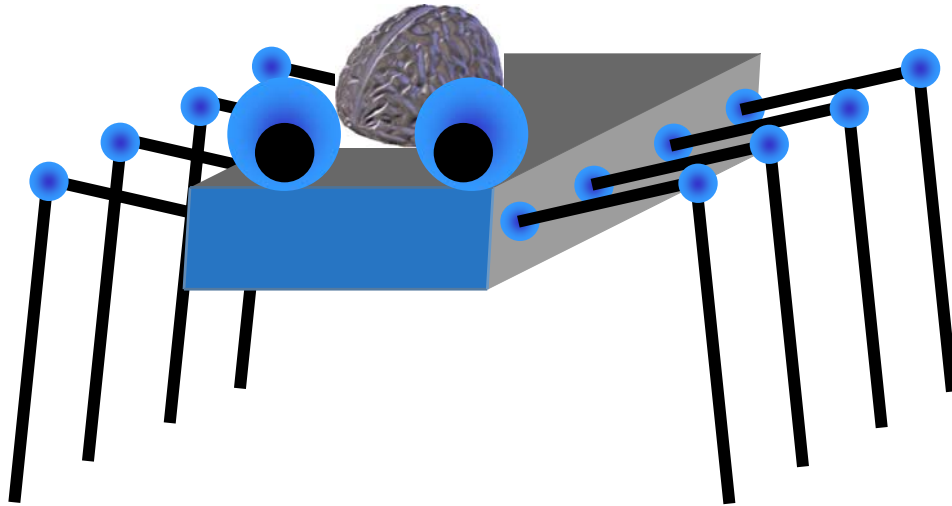


- Two visual systems allow stereoscopic vision, but require one more degree of freedom
- Focus adds another DoF

Hexapod/Octopod Actuators

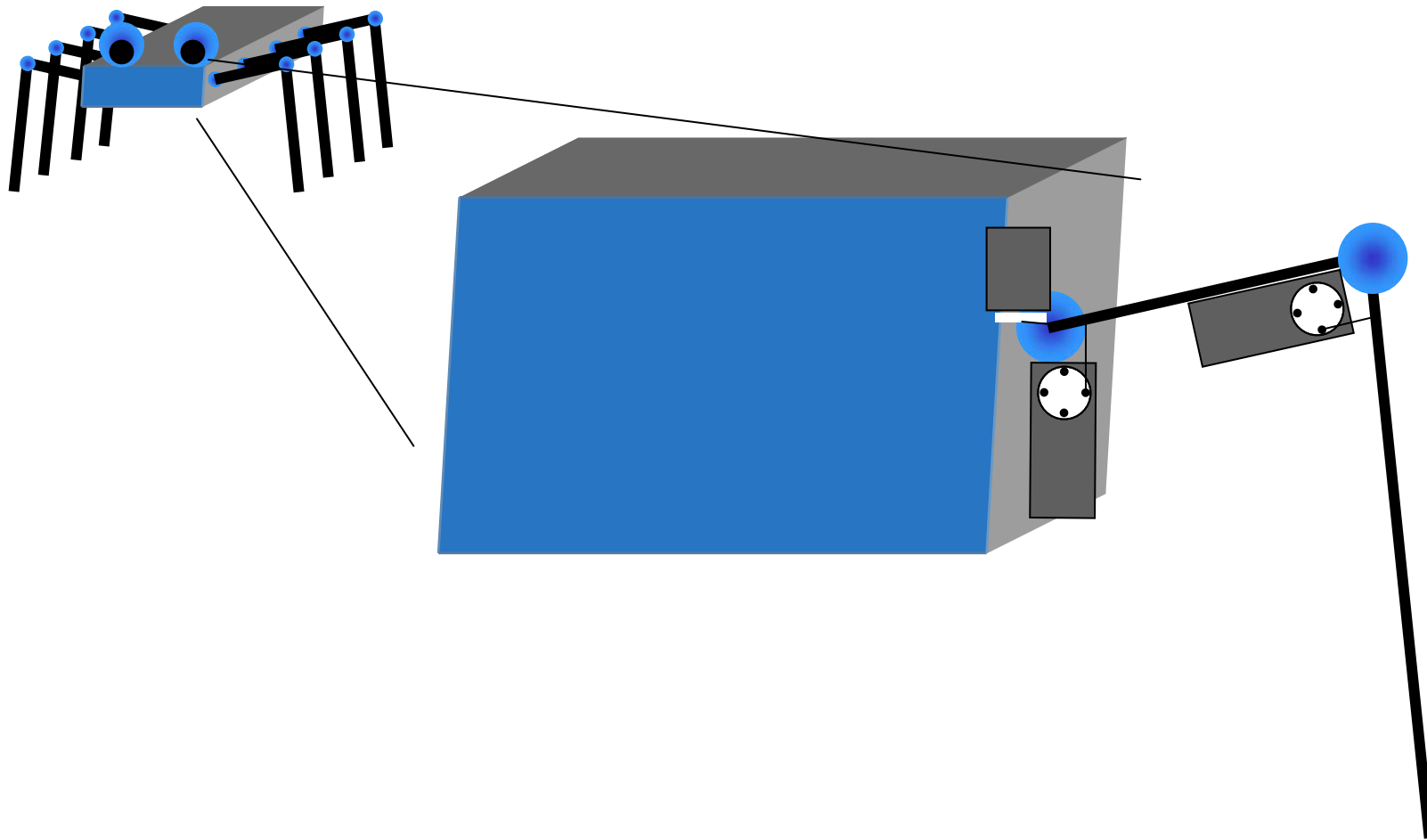


Hexapod/Octopod Actuators

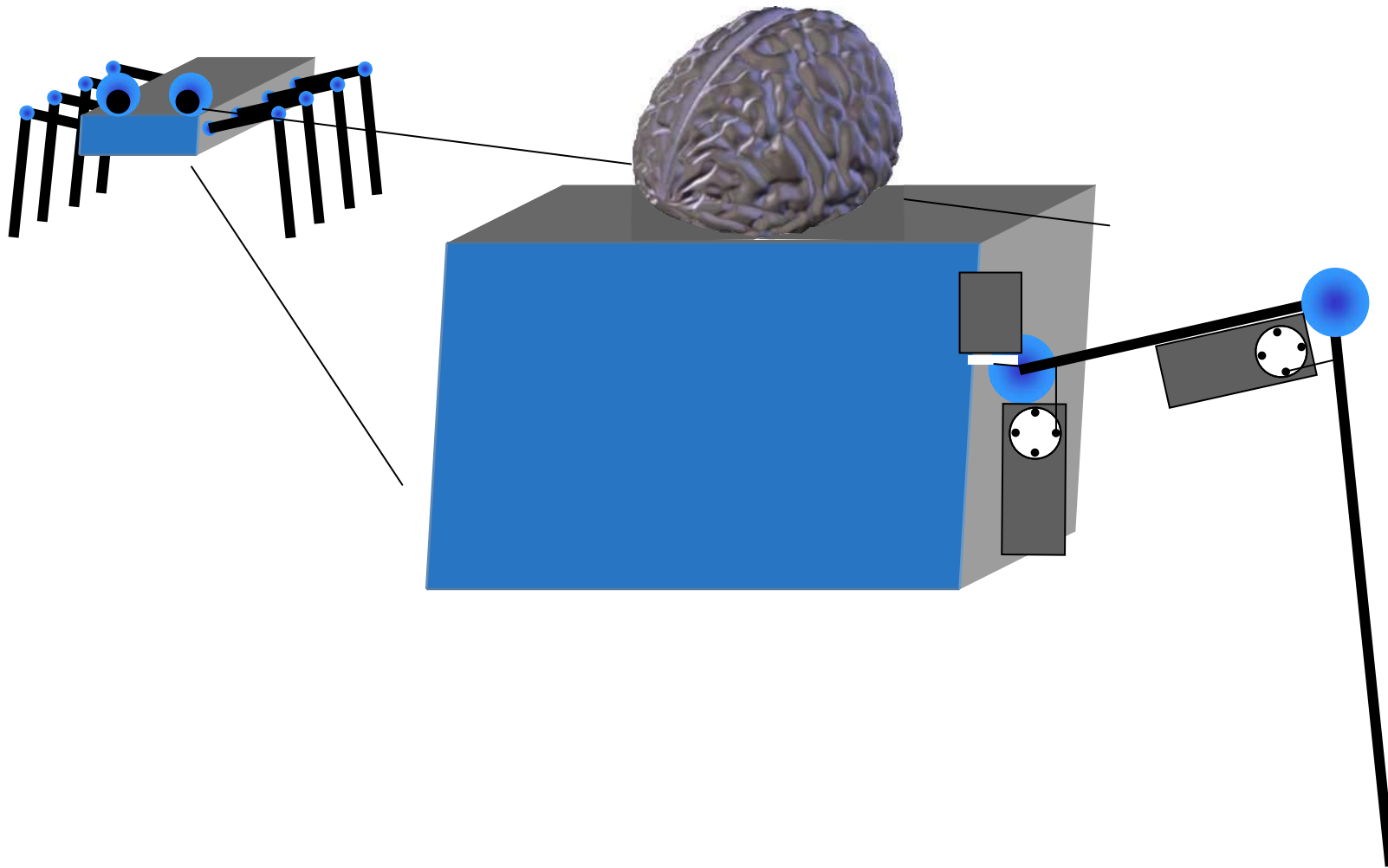


2 to 4 vision controllers
6 to 8 appendages → 18 to 24 controllers
20 to 28 controllers

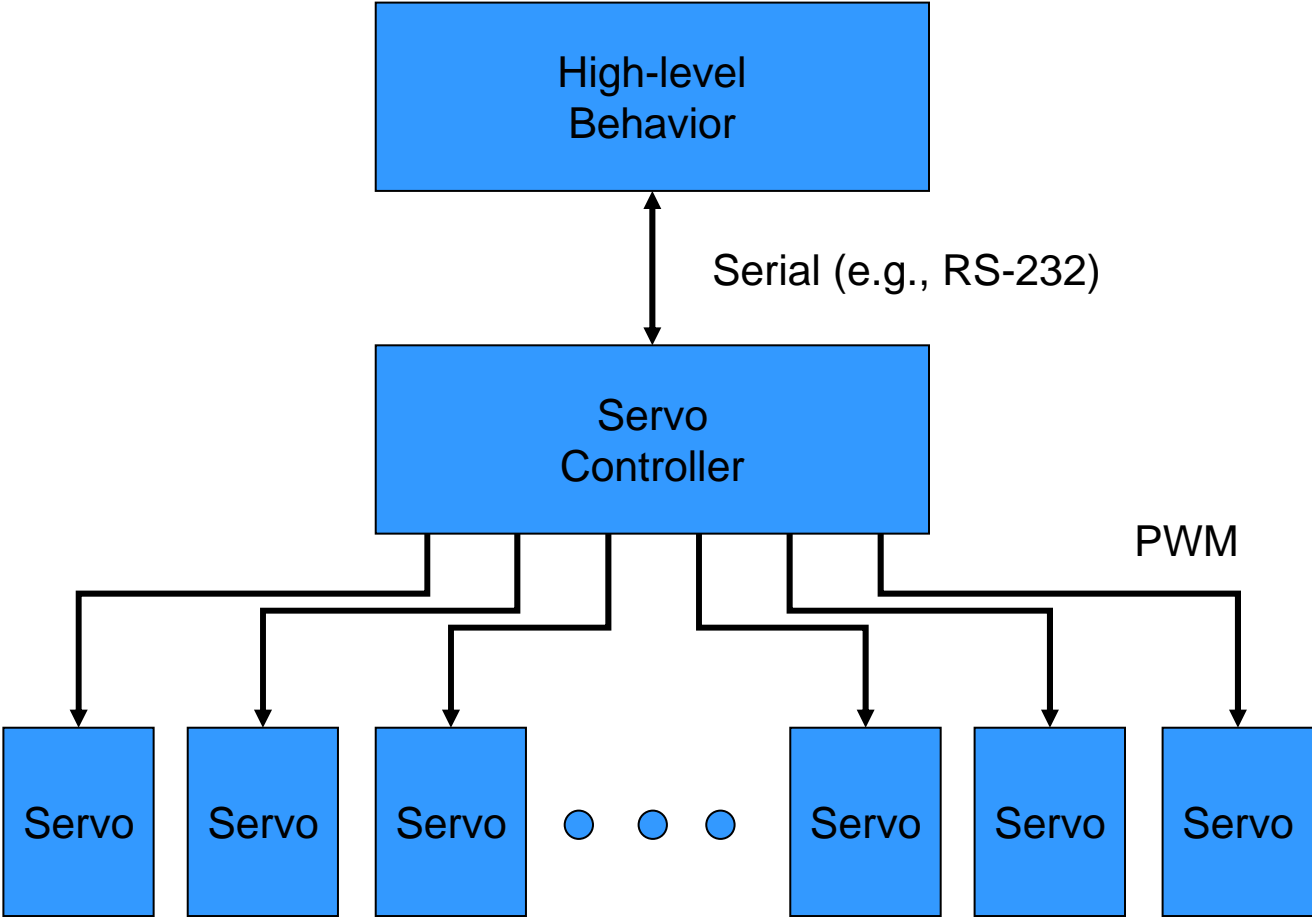
Hexapod/Octopod Actuators



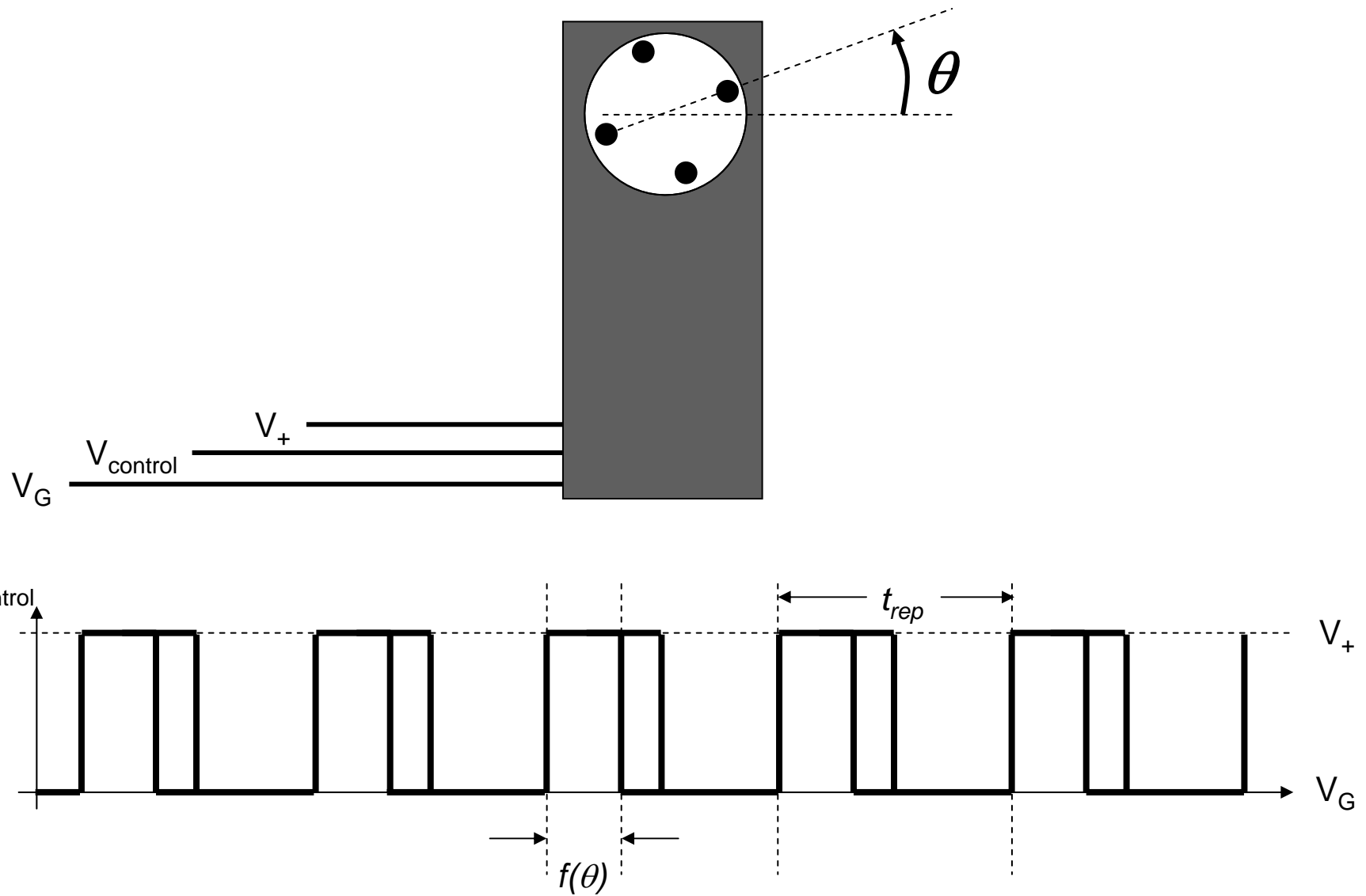
Hexapod/Octopod Actuators/Controller



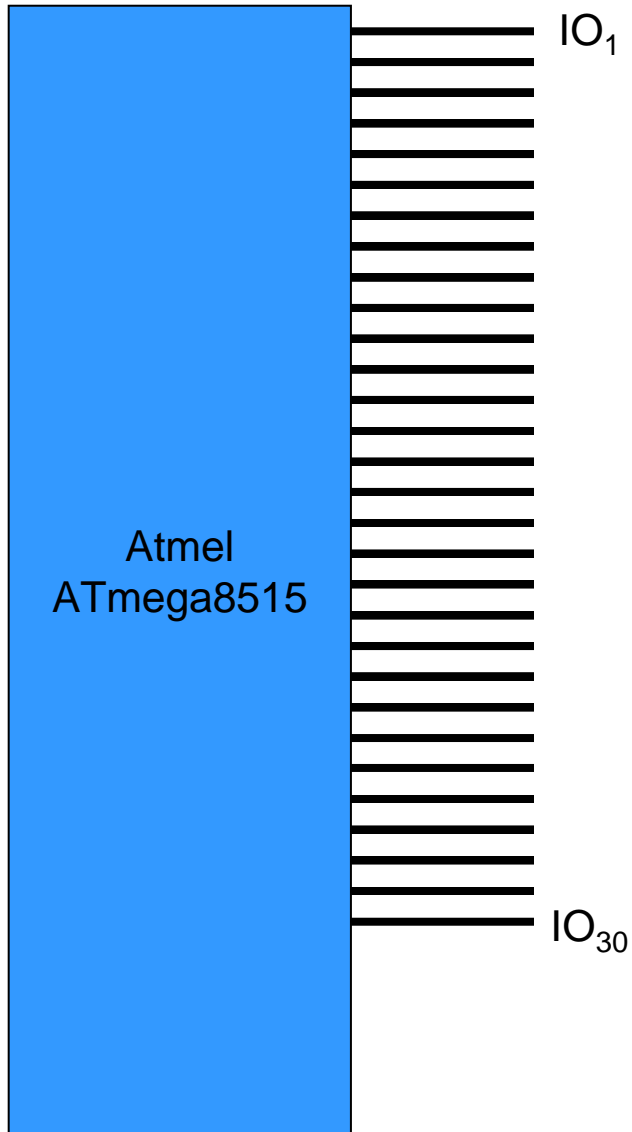
Distributed Control



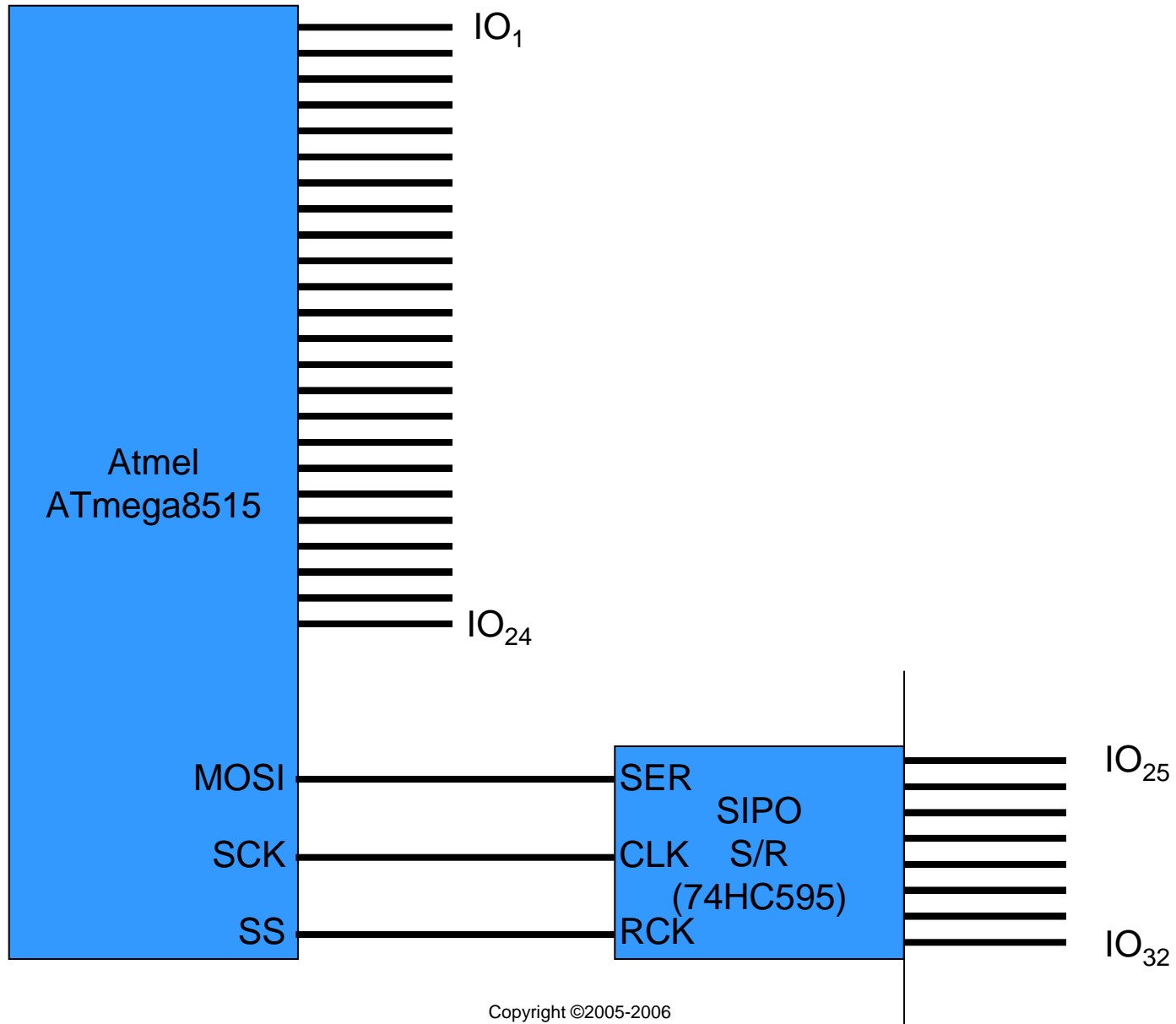
Servo Operation



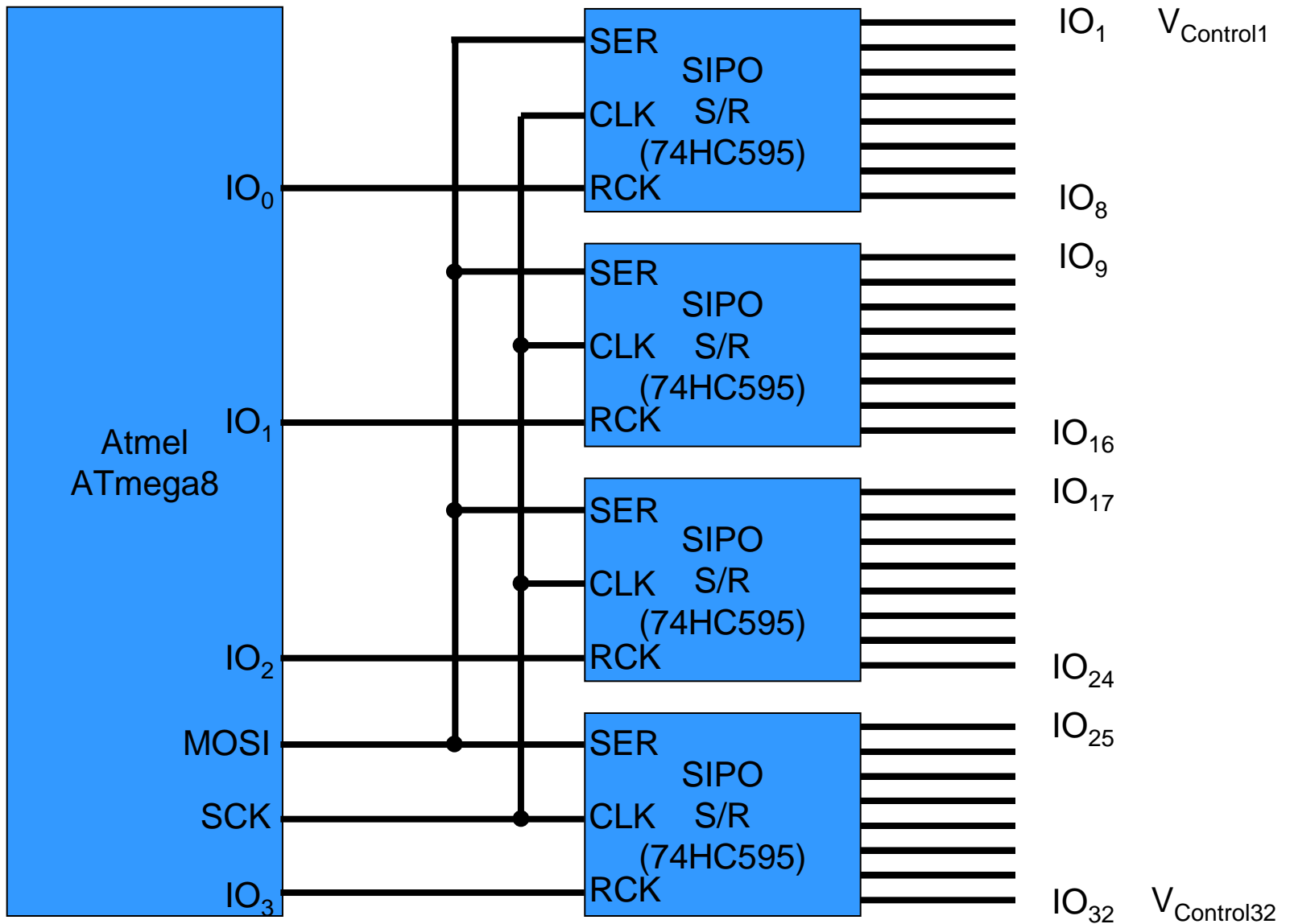
Servo Controller Options



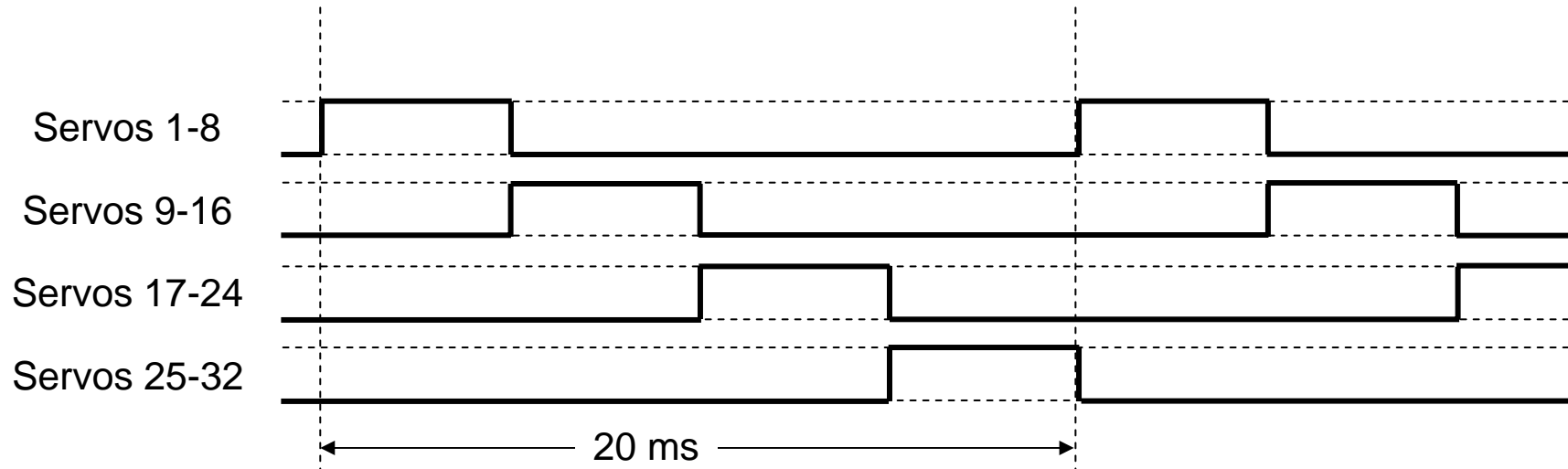
Servo Controller Options



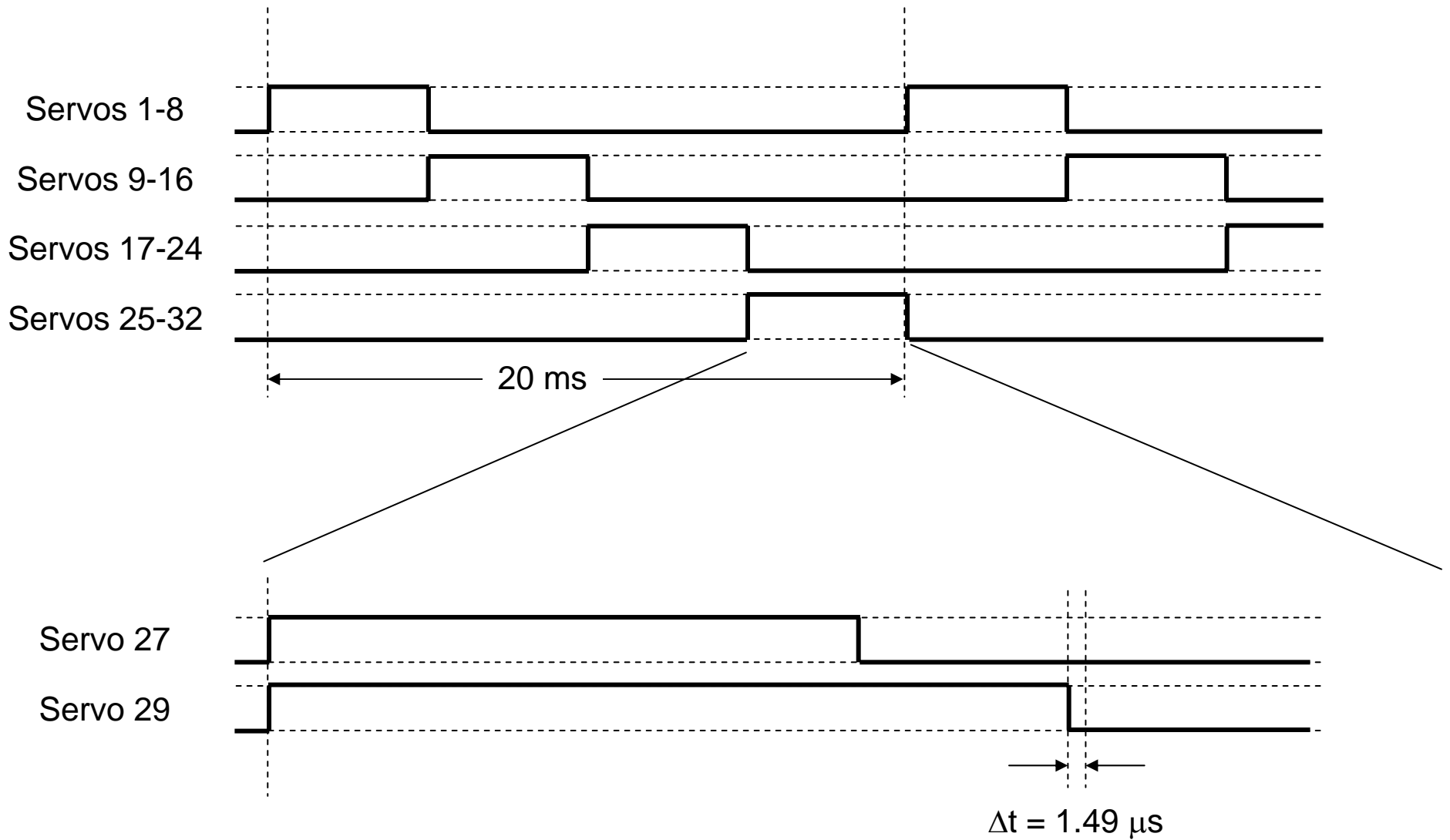
Servo Controller Options



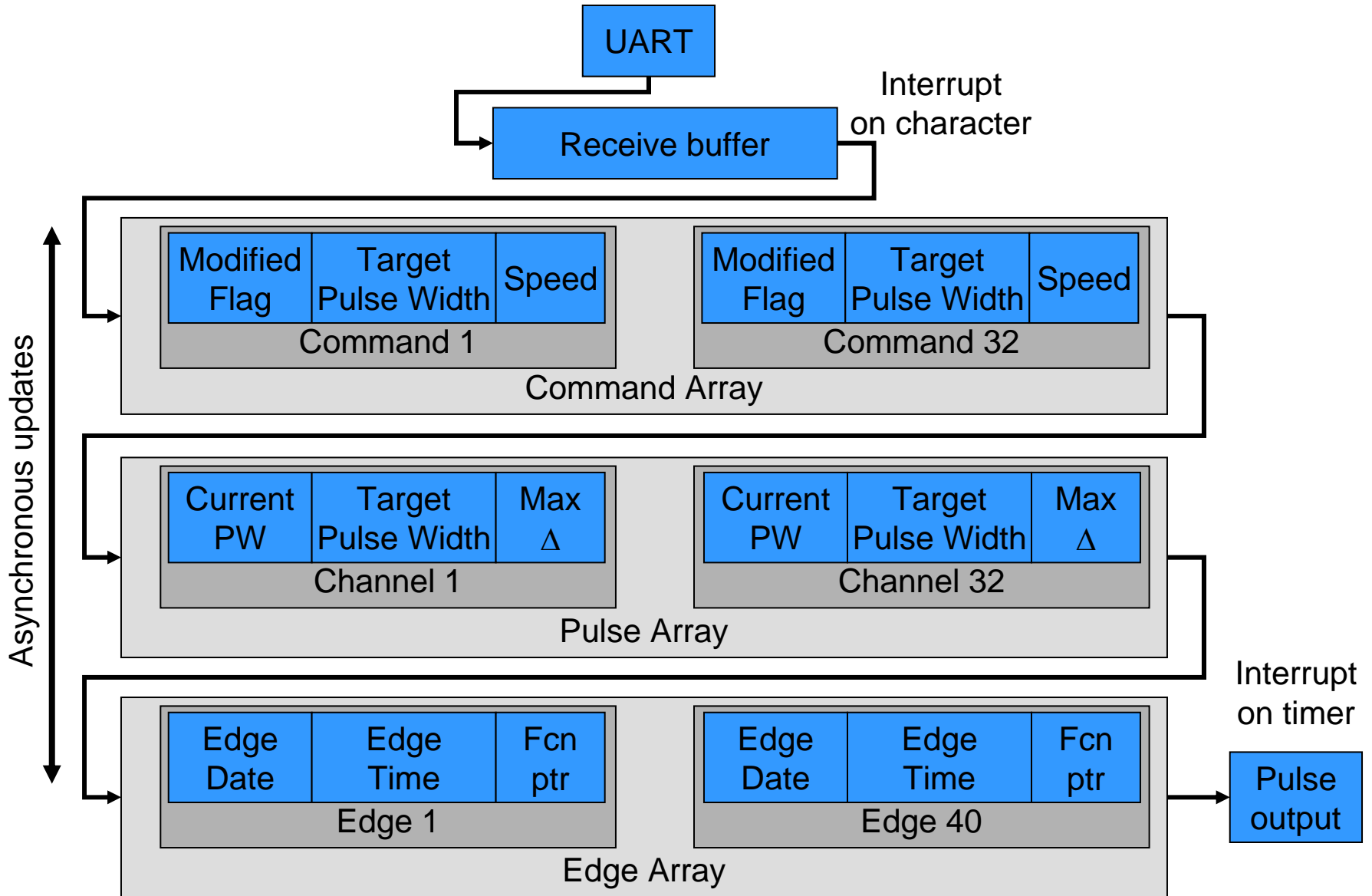
Pulse Timing



Pulse Timing



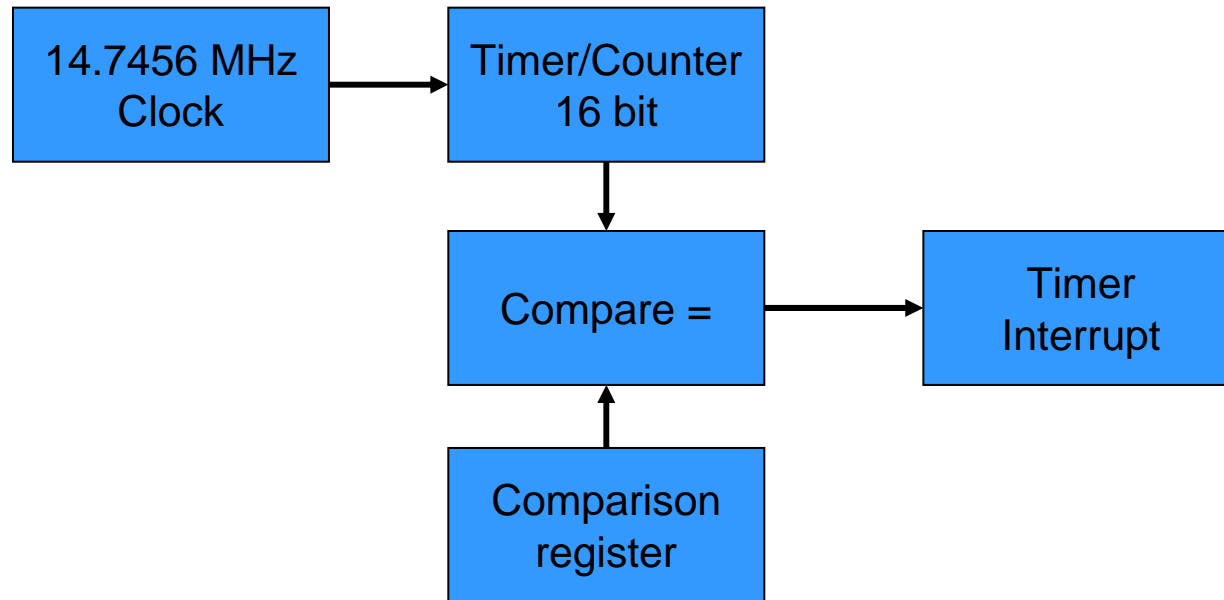
Pulse Control Data Flow



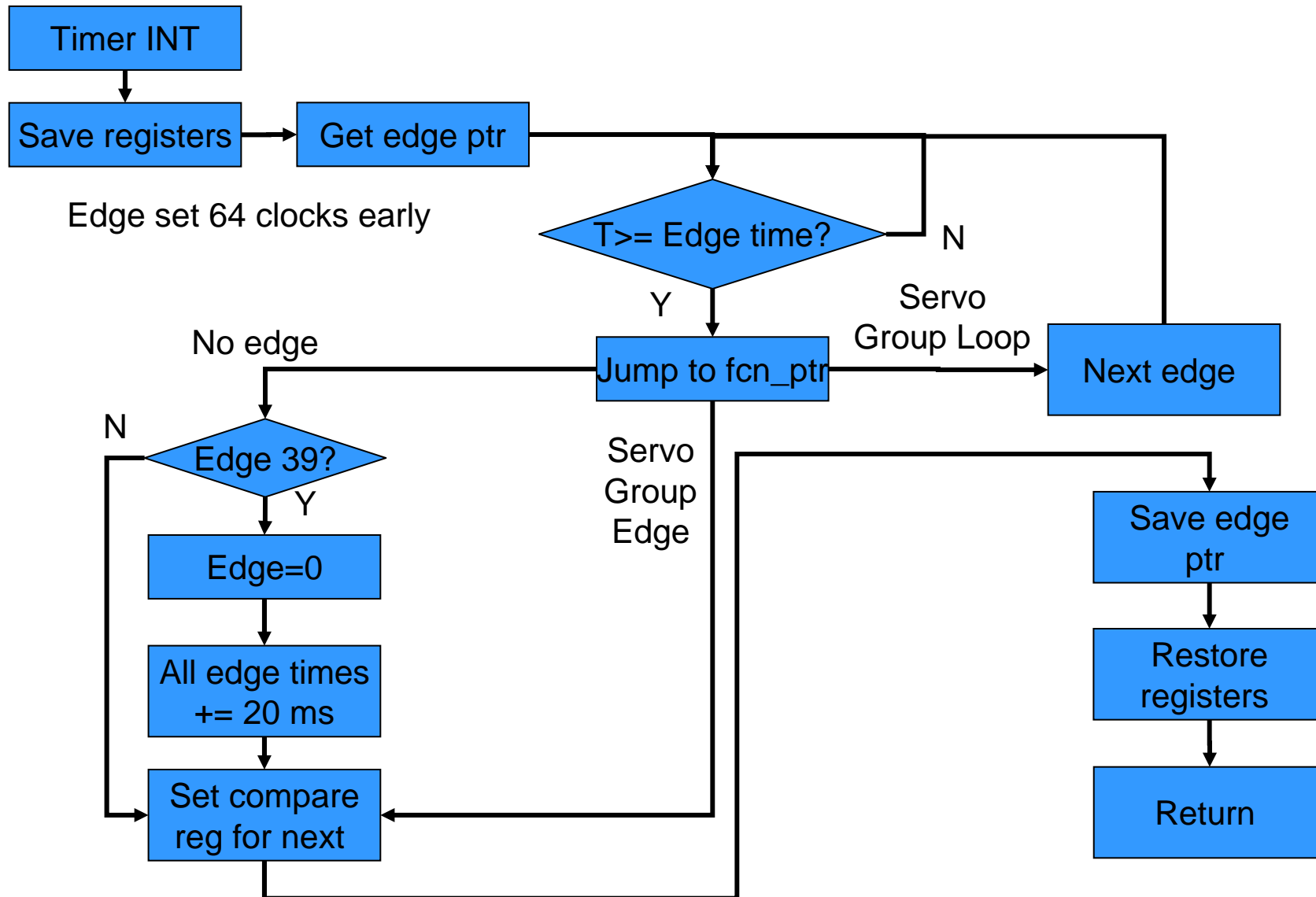
Pulse Generation

```
.  
.br/>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;  
  }  
}  
.br/>.br/.
```

Pulse Timing



Timer ISR



Homework

- No homework this week