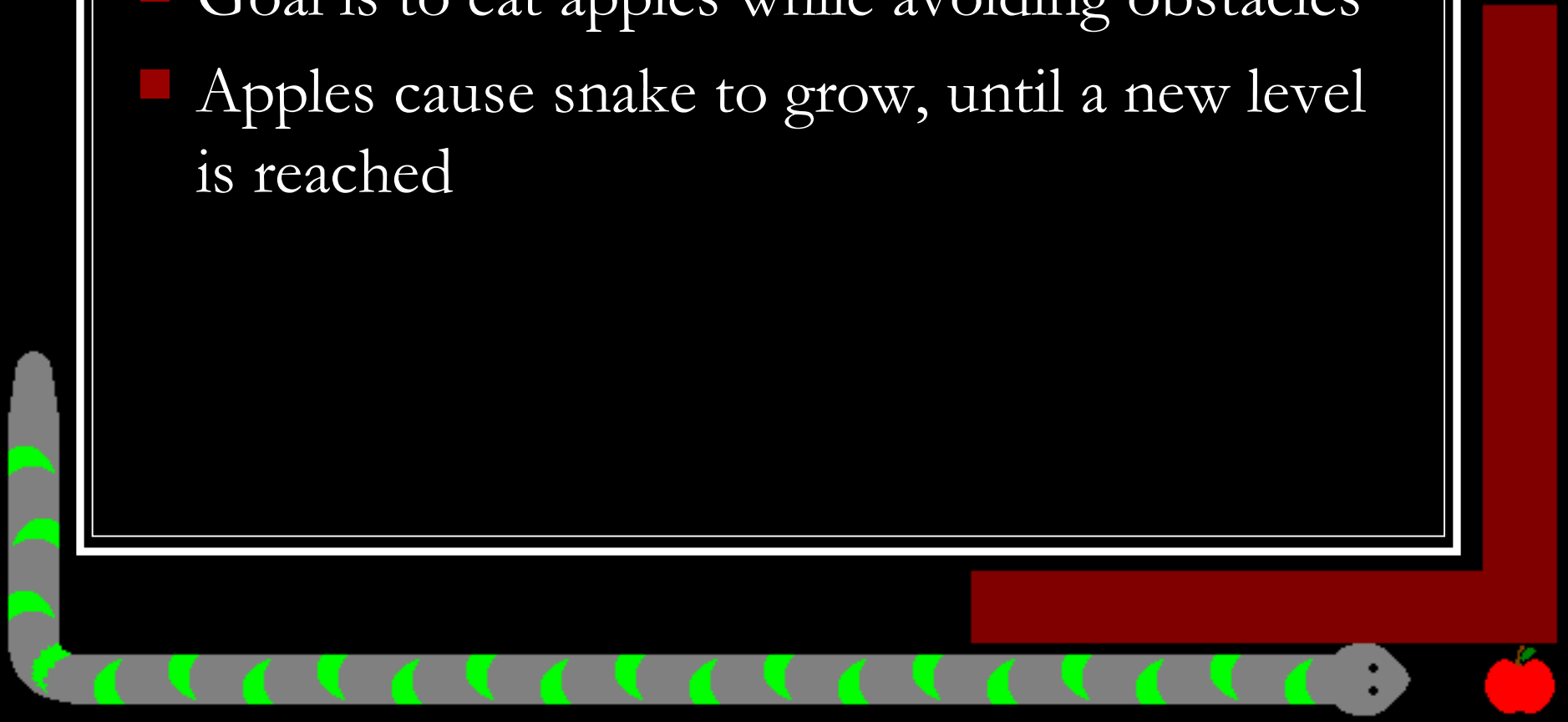
Serpent

Holli Rachall

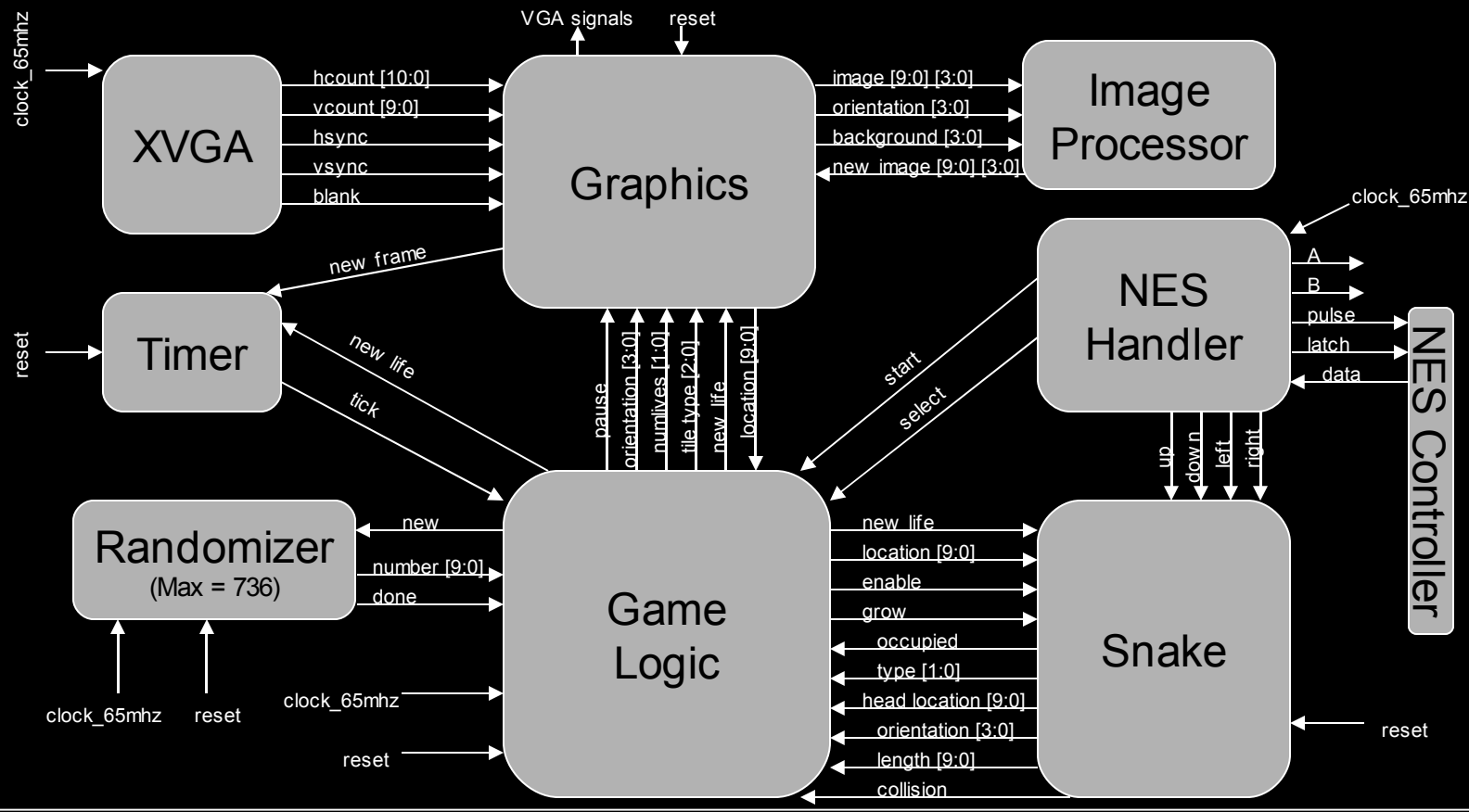
6.111 Fall 2006

The Game

- Player controls snake with directional buttons
- Goal is to eat apples while avoiding obstacles
- Apples cause snake to grow, until a new level is reached

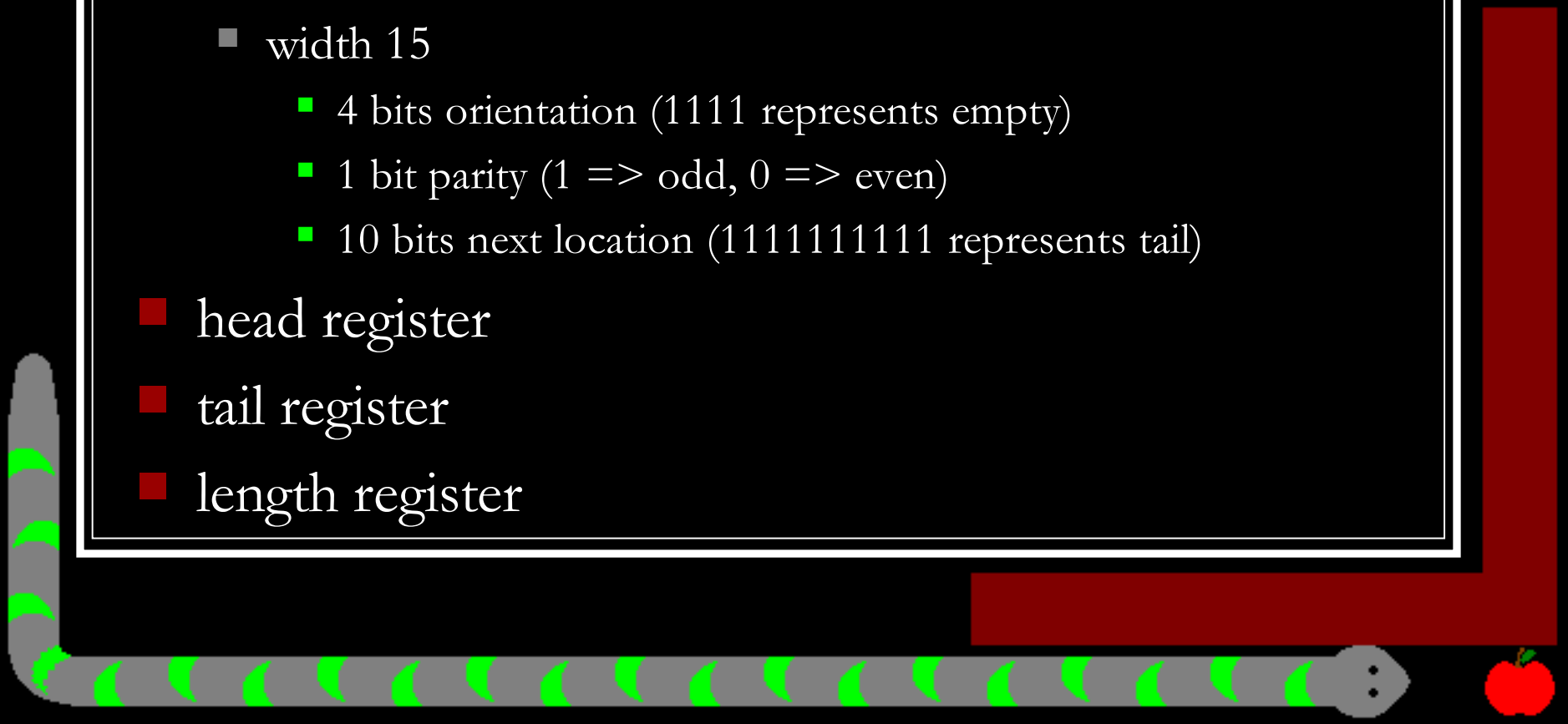


System


clock_65mhz
VGA signals
reset
XVGA
hcount [10:0]
vcount [9:0]
hsync
vsync
blank
Graphics
image [9:0] [3:0]
orientation [3:0]
background [3:0]
new_image [9:0] [3:0]
Image Processor
clock_65mhz
new_frame
A
B
pulse
latch
data
NES Handler
NES Controller
reset
Timer
new_life
tick
pause
orientation [3:0]
numlives [1:0]
tile type [2:0]
new_life
location [9:0]
start
select
up
down
left
right
Randomizer
(Max = 736)
new
number [9:0]
done
clock_65mhz
reset
Game Logic
clock_65mhz
reset
new_life
location [9:0]
enable
grow
occupied
type [1:0]
head location [9:0]
orientation [3:0]
length [9:0]
collision
Snake
reset

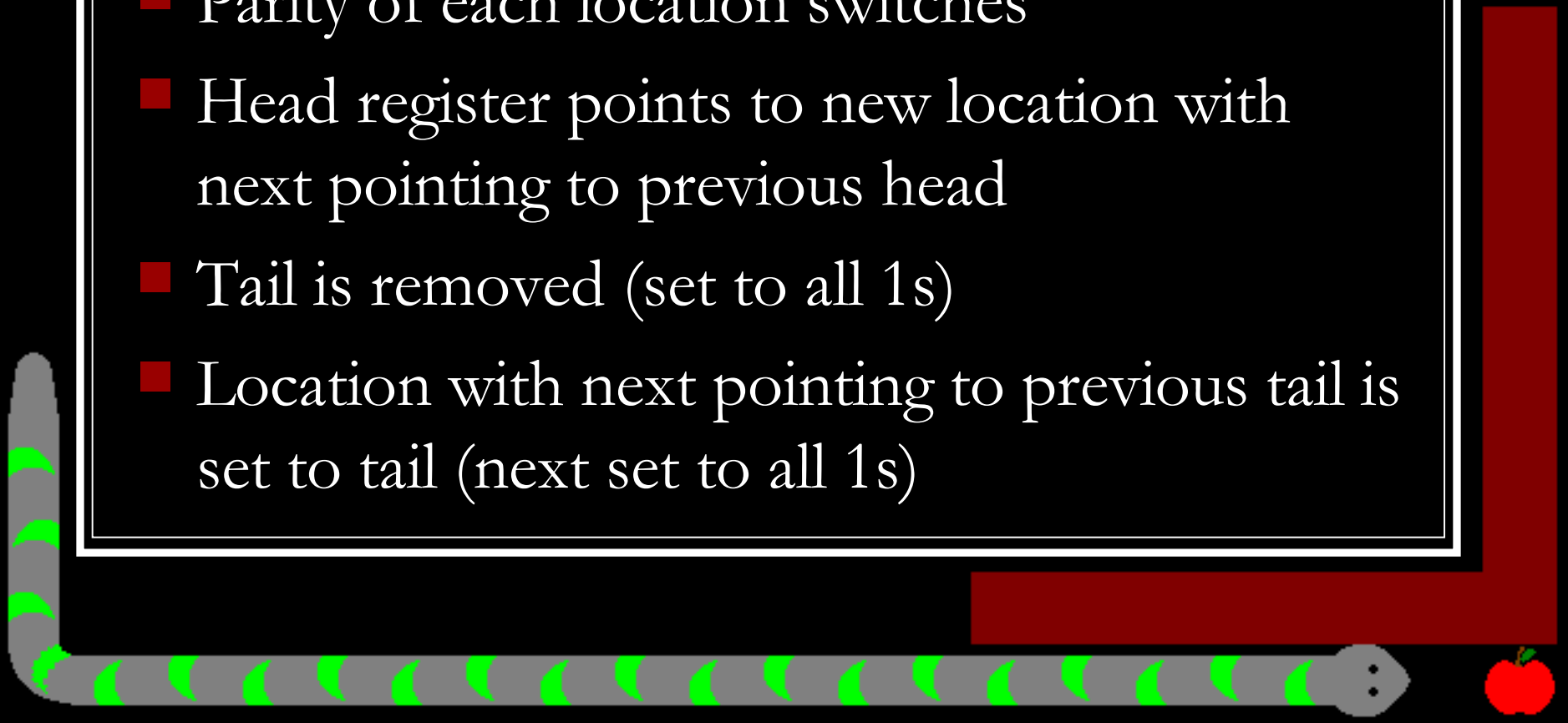
Snake Representation

- BRAM
  - length 736 (32 x 23)
  - width 15
    - 4 bits orientation (1111 represents empty)
    - 1 bit parity (1 => odd, 0 => even)
    - 10 bits next location (1111111111 represents tail)
- head register
- tail register
- length register



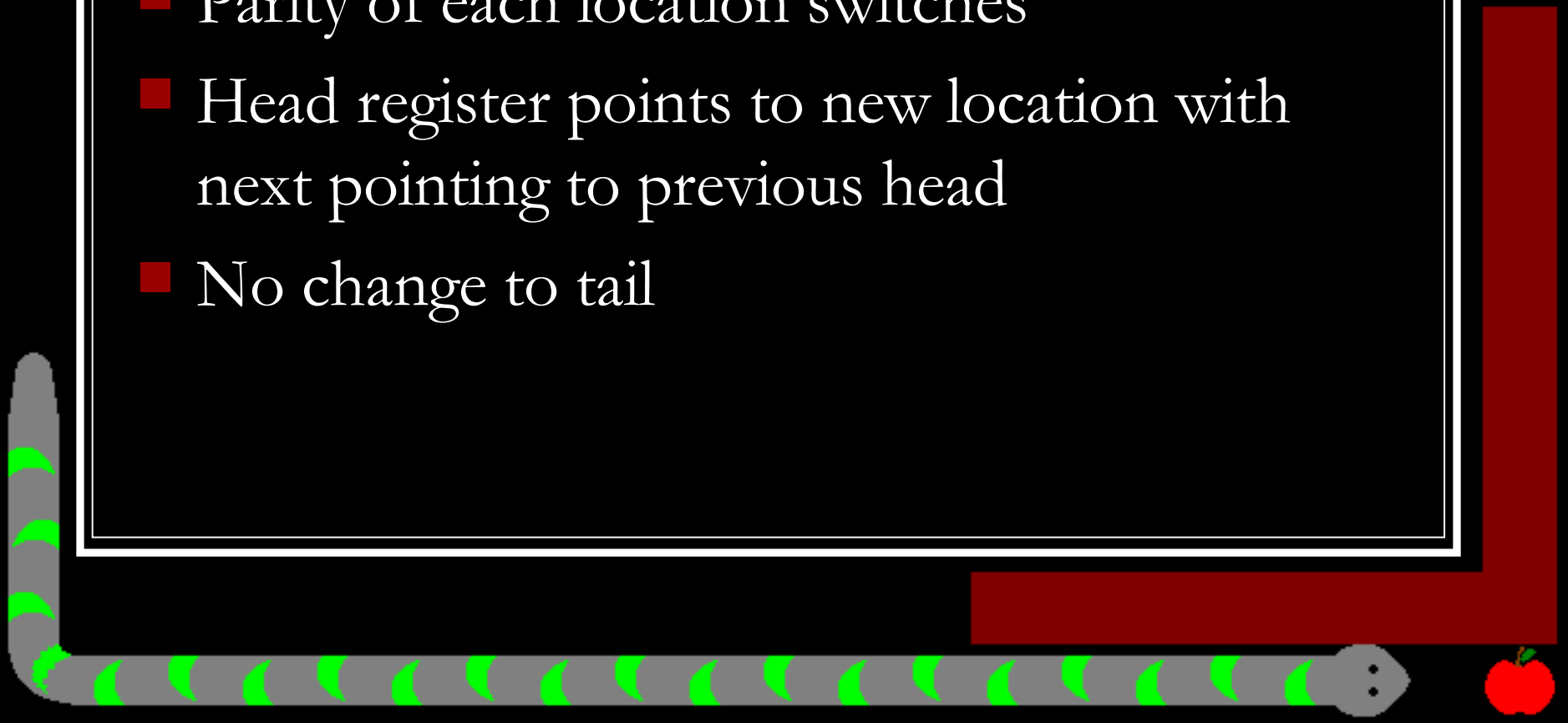
Snake Movement

- Snake moves on enable
- Parity of each location switches
- Head register points to new location with next pointing to previous head
- Tail is removed (set to all 1s)
- Location with next pointing to previous tail is set to tail (next set to all 1s)



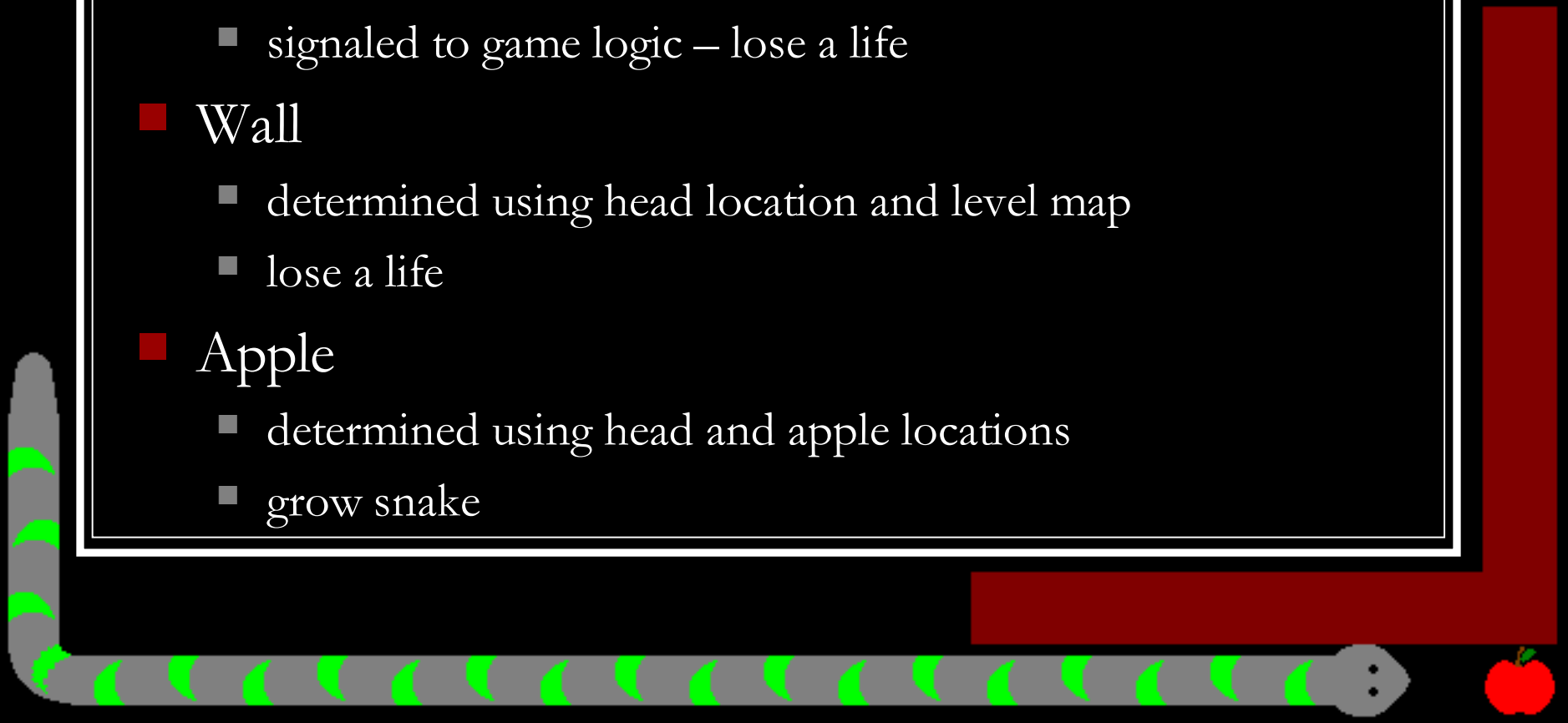
Snake Growth

- Snake grows upon collision with apple
- Parity of each location switches
- Head register points to new location with next pointing to previous head
- No change to tail



Collisions

- Snake
  - determined in snake module
  - signaled to game logic – lose a life
- Wall
  - determined using head location and level map
  - lose a life
- Apple
  - determined using head and apple locations
  - grow snake



Schedule

- Monday, November 20
  - snake module complete
  - game logic module complete
  - randomizer complete
  - timer complete
  - rudimentary graphics engine
- Monday, November 27
  - image processor complete
  - graphics draws correct image at each tick
- Monday, December 4
  - graphics draws smooth transitions between ticks
- Final Week
  - finish report
  - work out bugs