



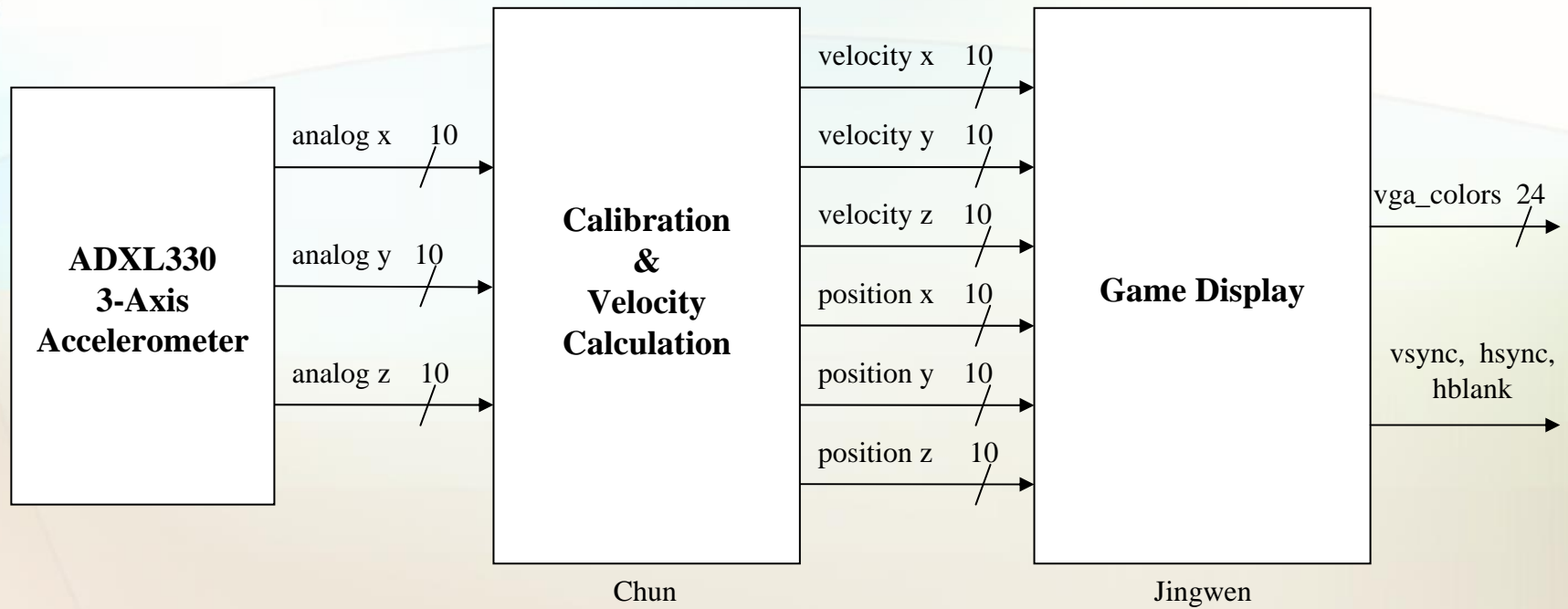
Virtual Basketball: How Well Do You Shoot?



Chun Li & Jingwen Ouyang

6.111 Spring 2007

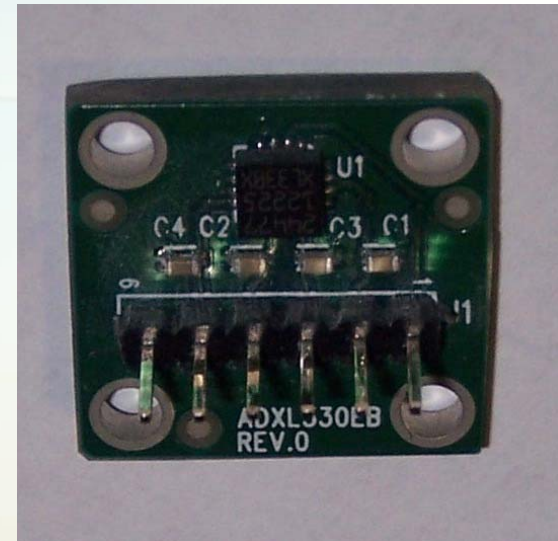
System Overview



Accelerometer & A/D Converter

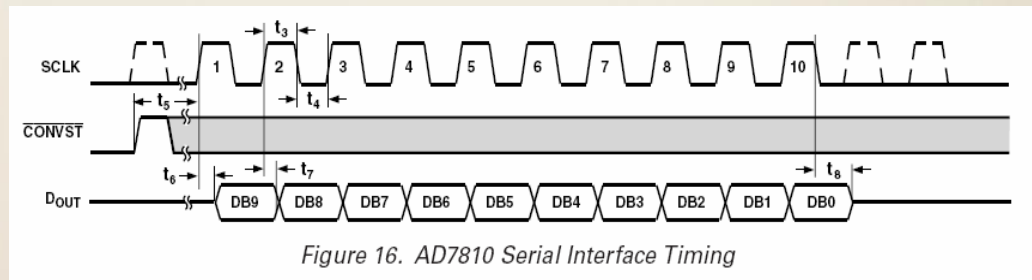
•ADXL330 3-axis Accelerometer

- $\pm 3g$ range
- Operating voltage 3V
- 300 mV/g sensitivity

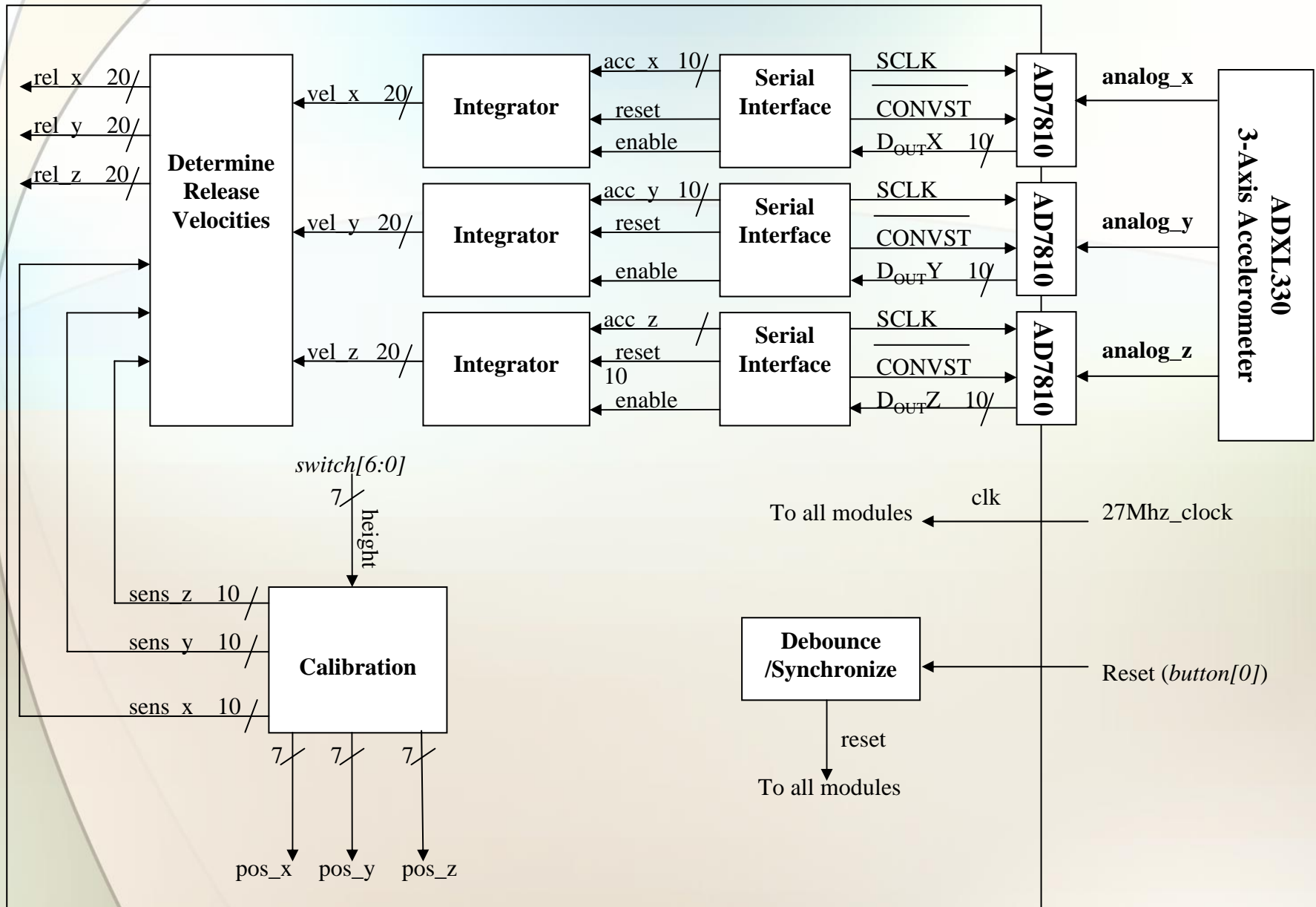


•AD7810 10-bit A/D Converter

- Sample at 1 kHz

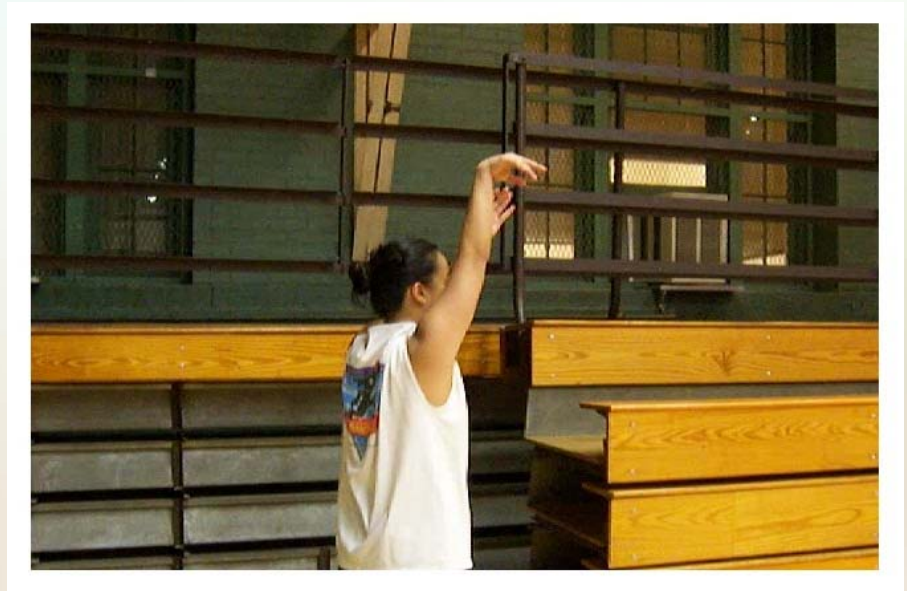


Velocity & Position Block Diagram

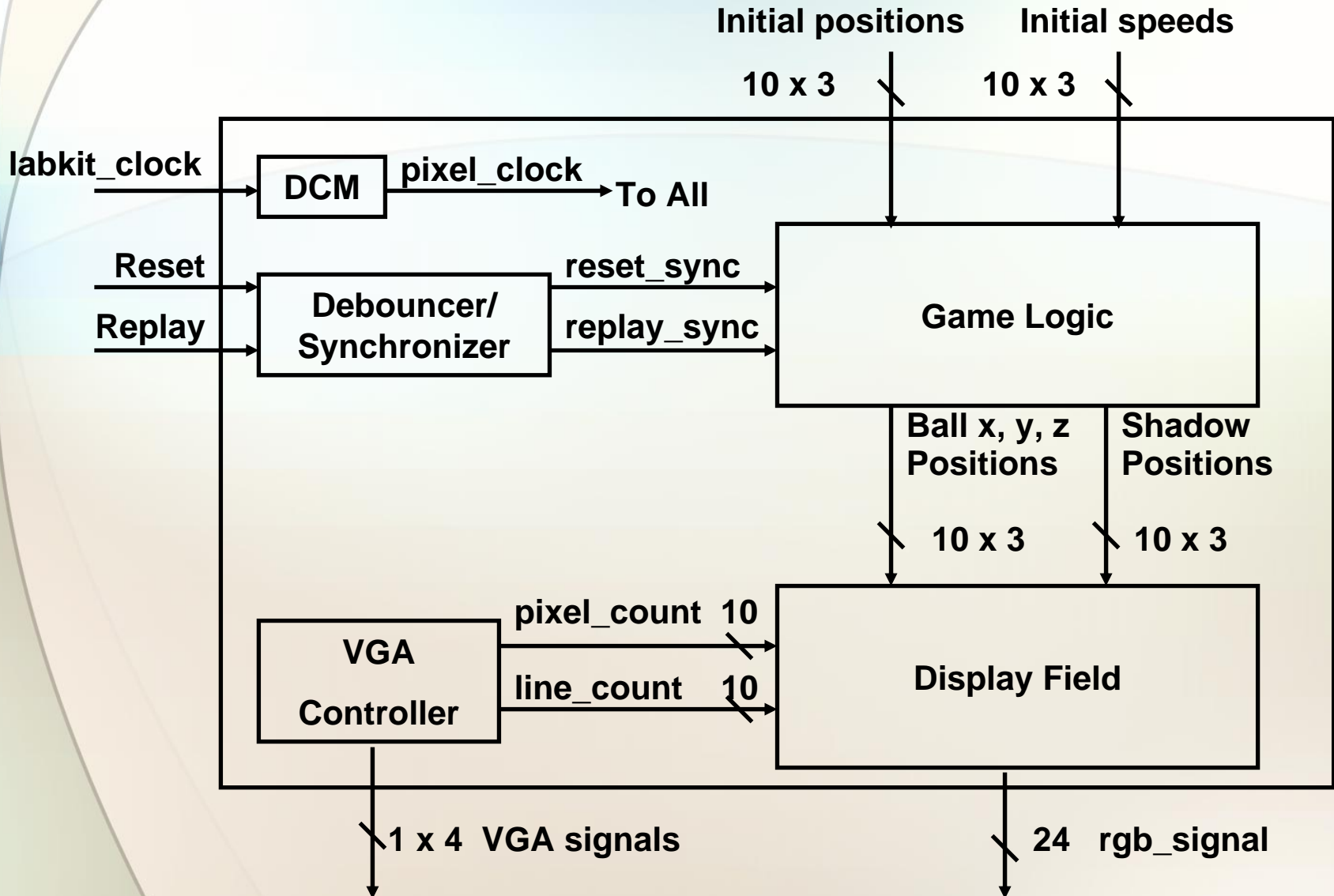


Calibration

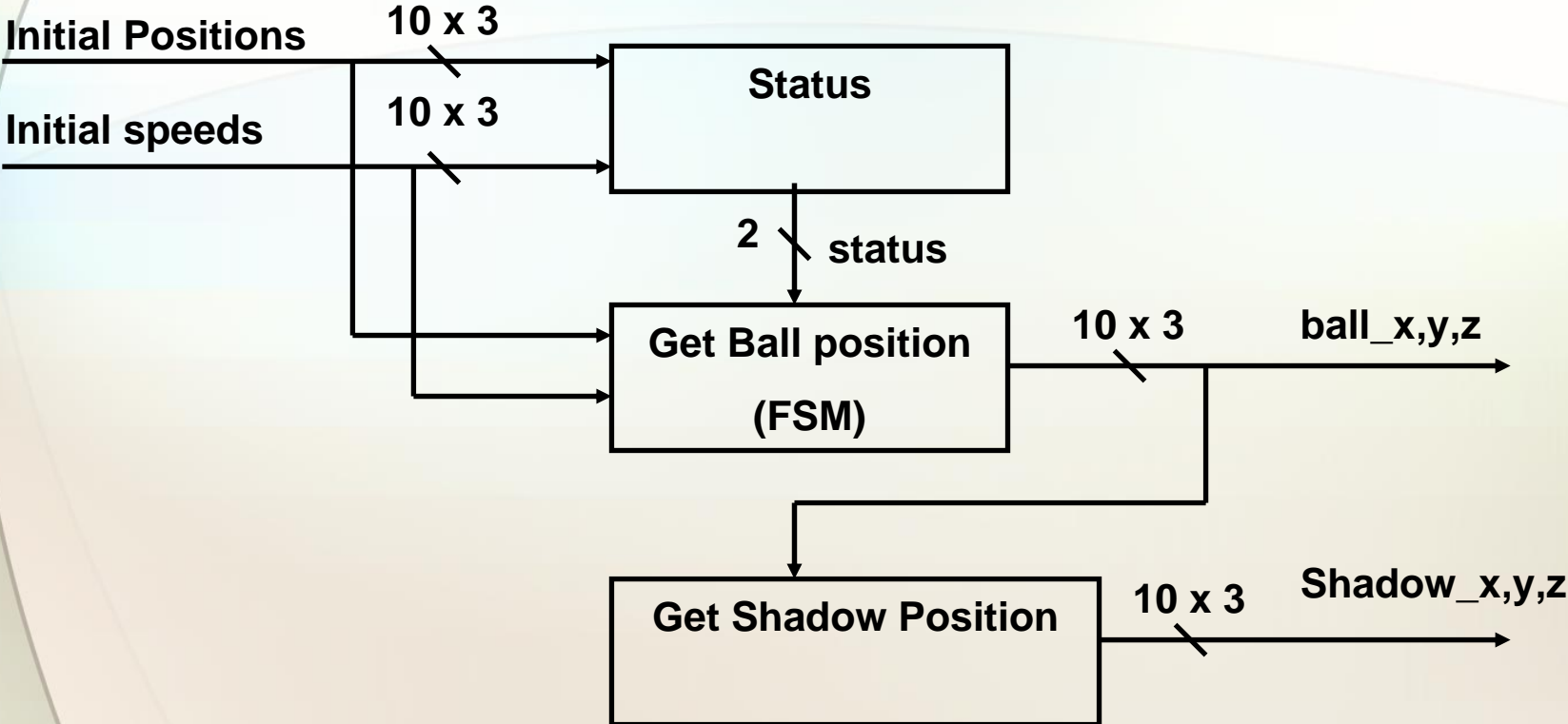
- Obtain player height
 - Calculate initial x, y, z positions
- Why: Variances
 - 0g bias point
 - sensitivity



Game Display Overview



Game Logic



Calculations

- **Speed**

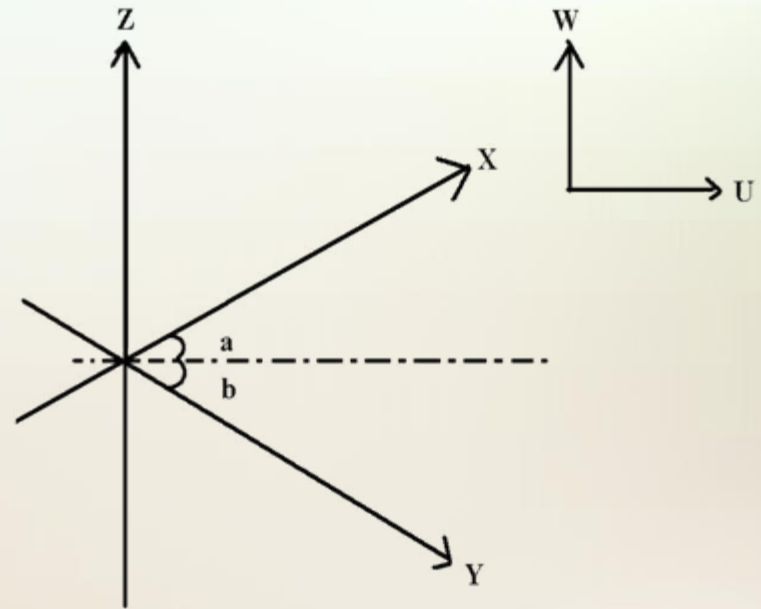
- $V_z = g \Delta t + V_z$ (only vertical direction has acceleration)
- * $\Delta t =$ time between each frame

- **Position**

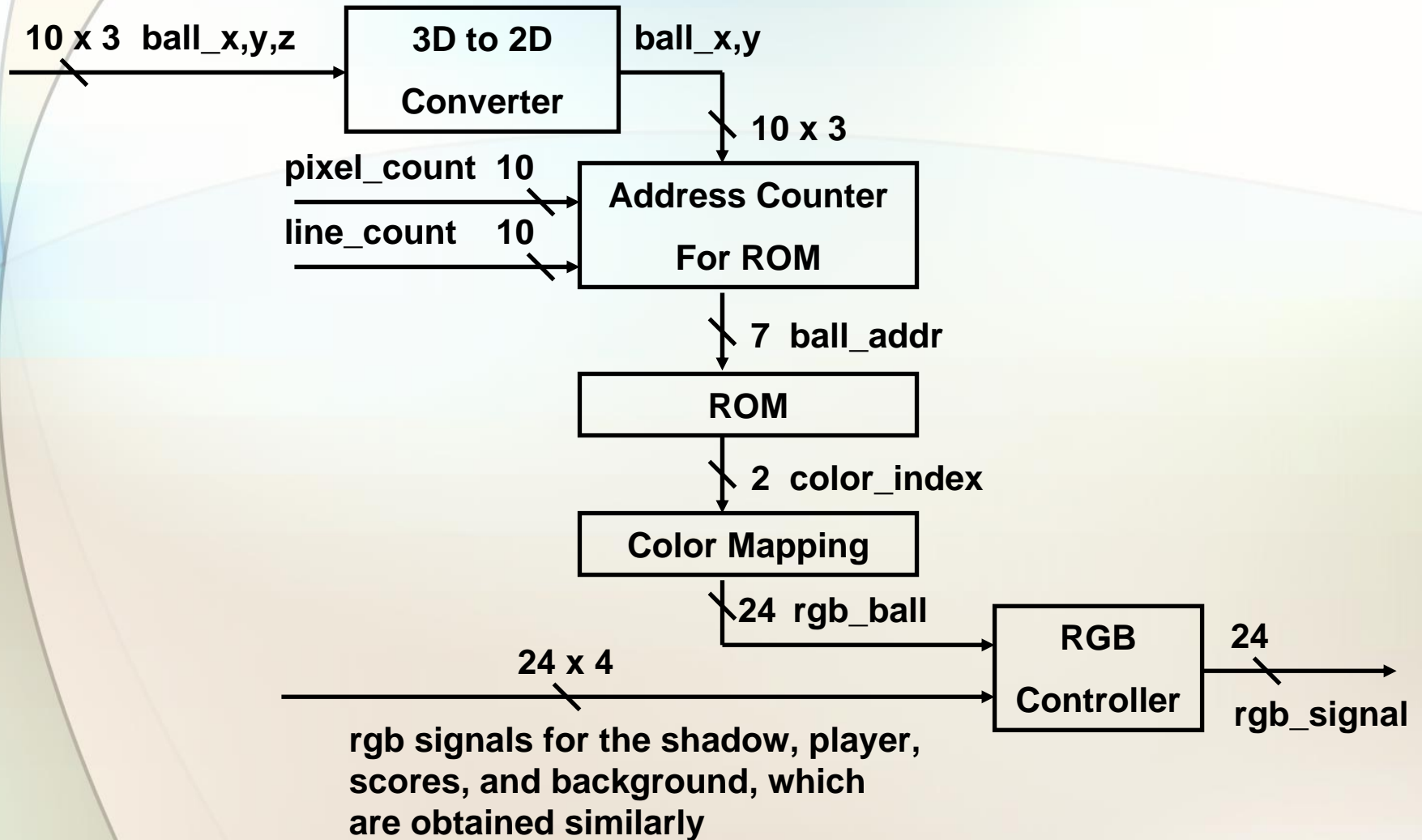
- $X = V_x \Delta t + X$
- $Y = V_y \Delta t + Y$
- $Z = V_z \Delta t + Z$

- **3D to 2D conversion**

- $W = Z + X \sin(a) - Y \sin(b)$
- $U = X \cos(a) + Y \cos(b)$



Display Field



Game Display Interface (1)

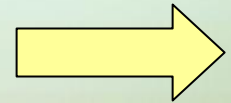


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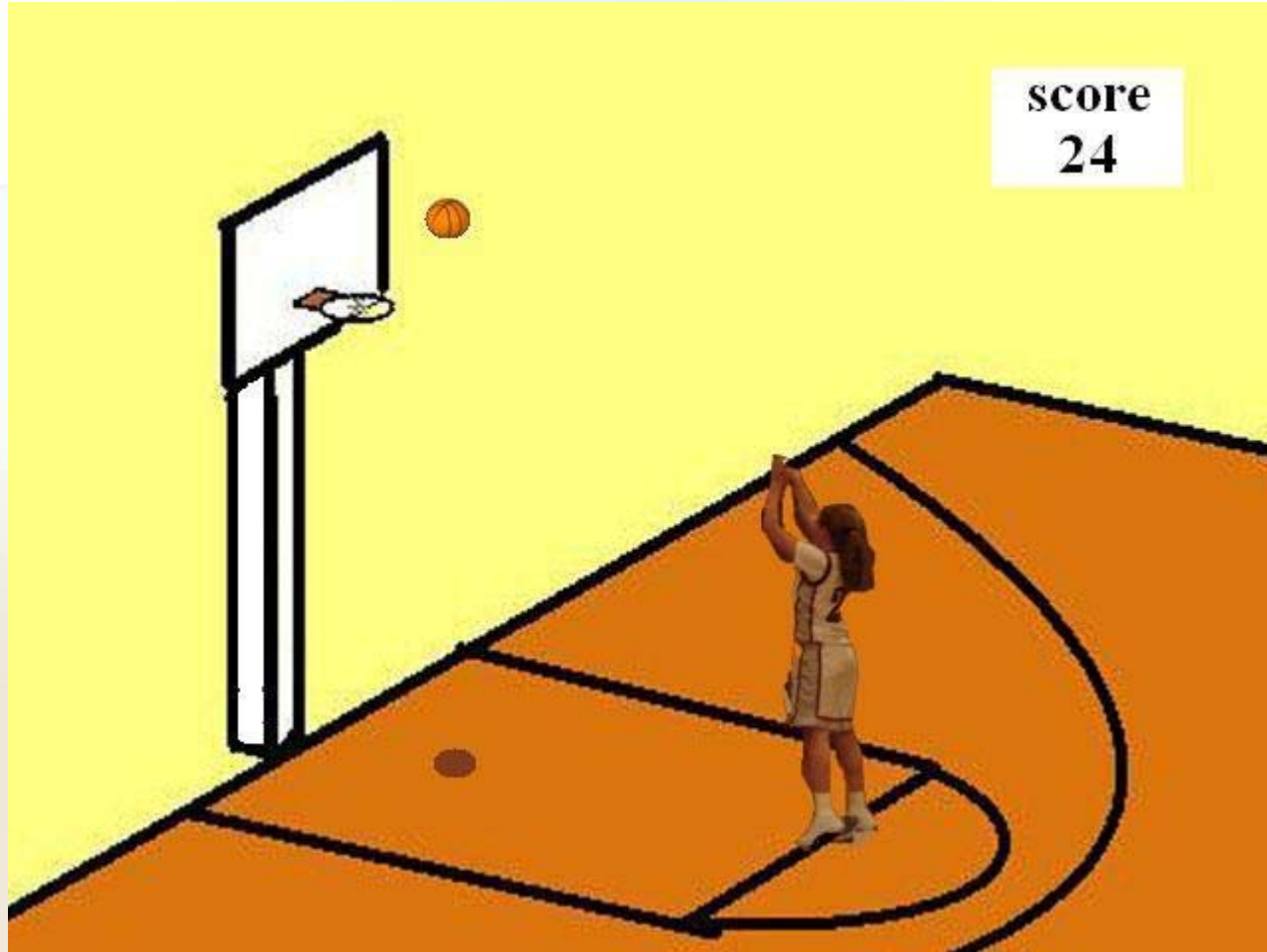
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Game Display Interface (2)



Conclusion

- practice shooting without a court
- Whenever
- Game for the Wii