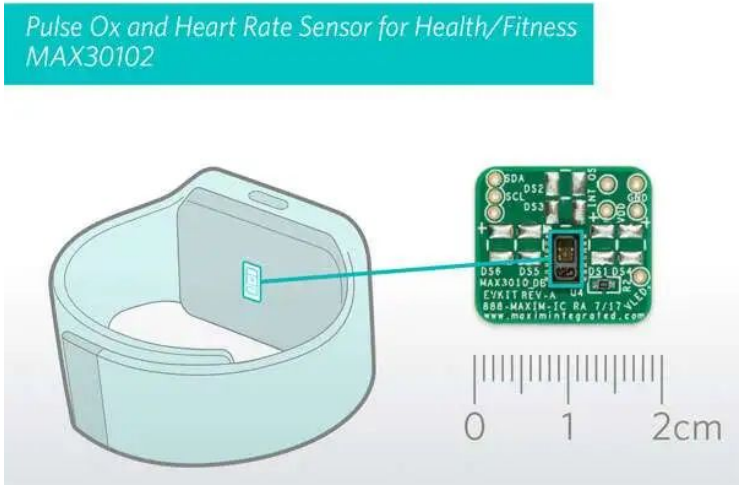
Dynamic adjustment of Virtual reality game difficulty using pulse oximeter

Pulse Oxymeter Sensor in AR/VR

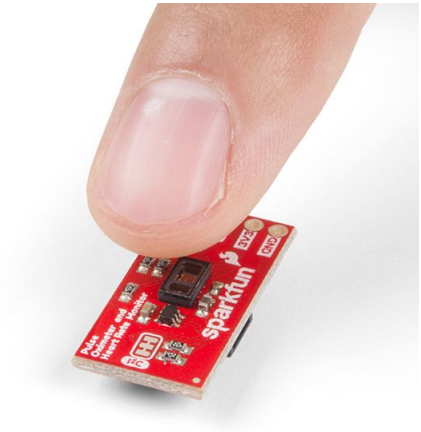
Aatmaj Mhatre


SpO2
97
PI
bpmPR
76
PULSE OXIMETER


MAX30100
VIN SCL SDA INT IRD RD GND

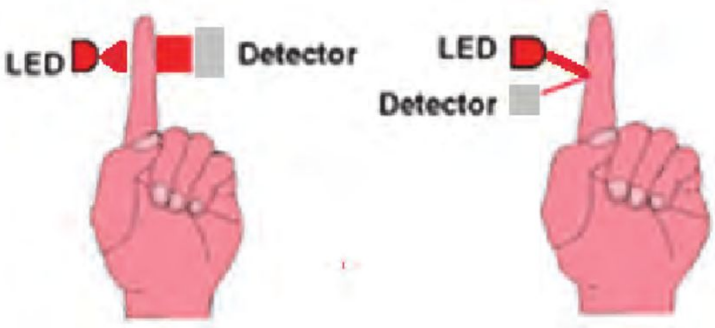

Pulse Ox and Heart Rate Sensor for Health/Fitness
MAX30102
SDA
SCL
INT
VIN
GND
DS2
DS3
DS6
DS5
DS1
DS4
MAX30102 DB
EVKIT REV-A
U4
888-MAXIM-IC RA 7/17
www.maximintegrated.com
0
1
2cm

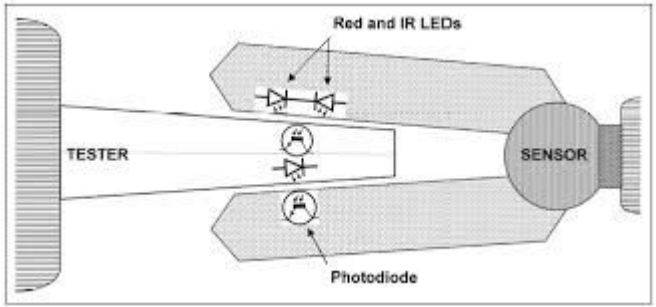

UNO
ARDUINO
BPM : 76.26
SpO2: 98%


sparkfun

About the Sensor

The pulse oximeter uses a cold light source that shines a light through the fingertip, making the tip appear to be red. By analyzing the light from the light source that passes through the finger, the device is able to determine the percentage of oxygen in the red blood cell.





Characteristics of the sensor

- Low cost - ₹ 230.00 (pulse only sensor)
- No damage to body (non-invasive biological sensors)
- 90%–100% accuracy

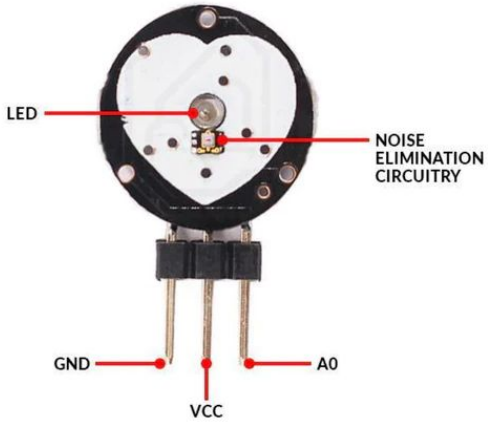
Working

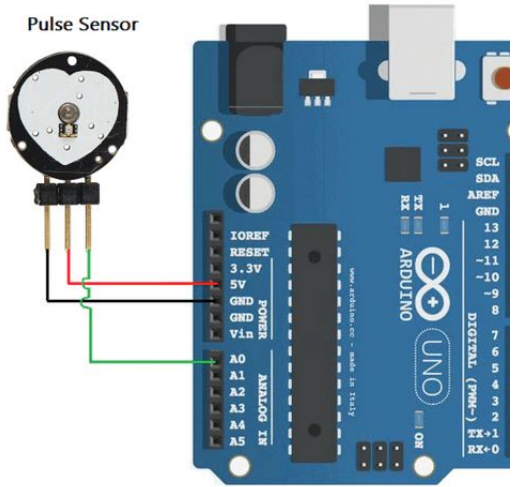
Oxygenated hemoglobin absorbs more infrared light and allows more red light to pass through. Whereas **Deoxygenated hemoglobin absorbs more red light** and allowing more infrared light to pass through.

Principle - Less IR recieved, more oxygen present in blood.

Pulse only sensor

Measures green light, same principle of absorption





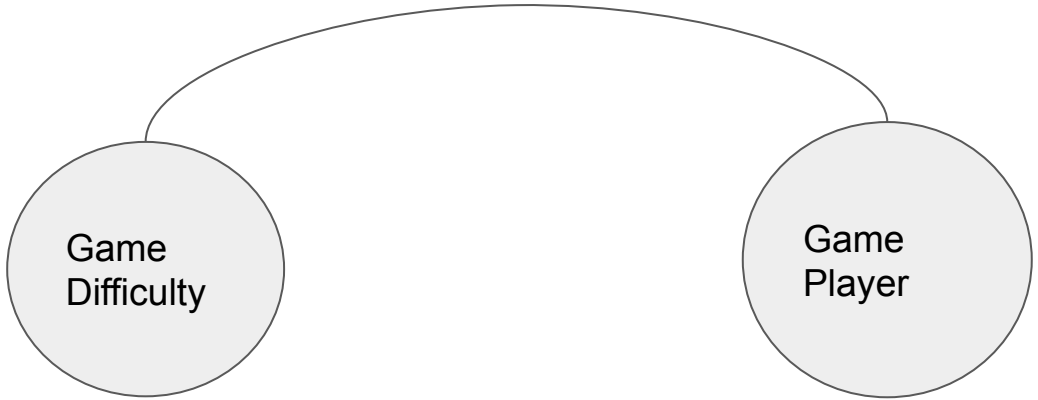
Application to AR/VR

- Dynamically adjust level difficulty
- High-End Immersive games
- Games involving Violence increase heartbeat in immersive technology

Increase the difficulty of the game if the heartbeat is slow,
Decrease the difficulty if the heartbeat is fast

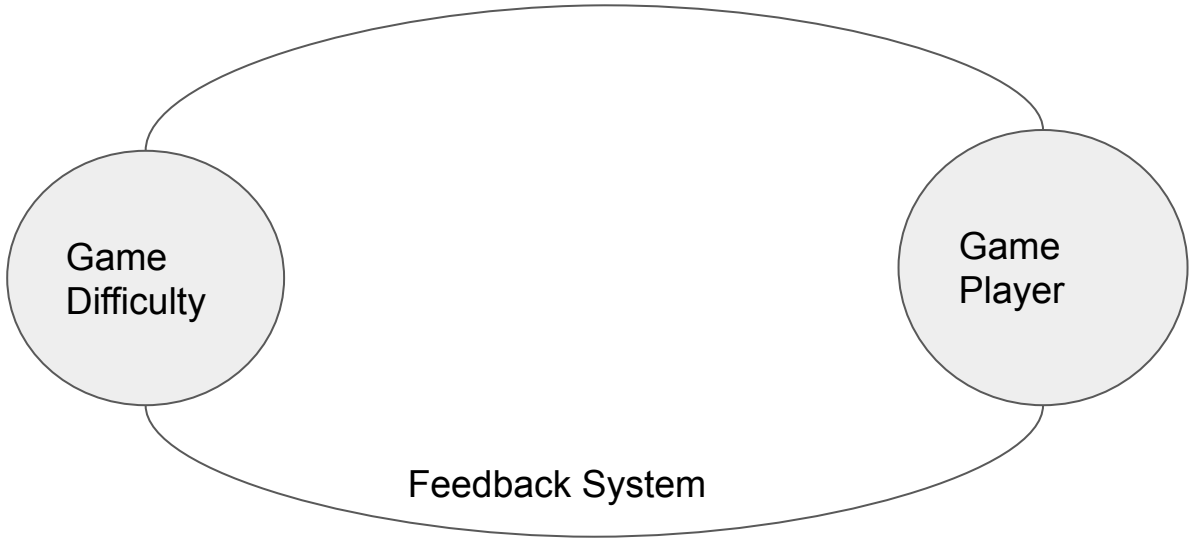
Application to AR/VR

Traditional AR VR games



Application to AR/VR

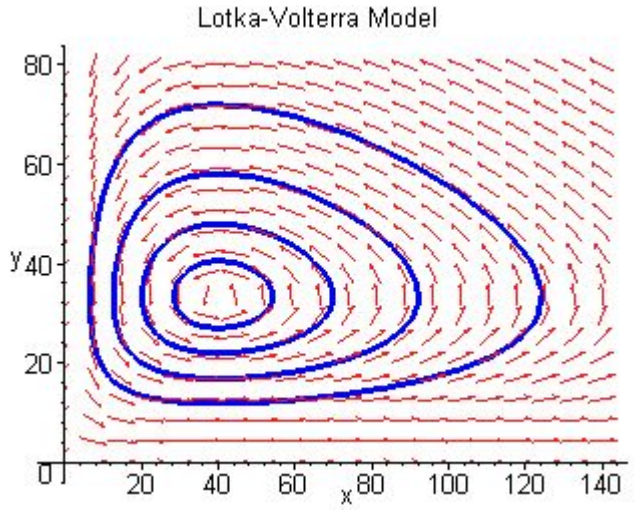
AR VR games with Pulse-Oximeter

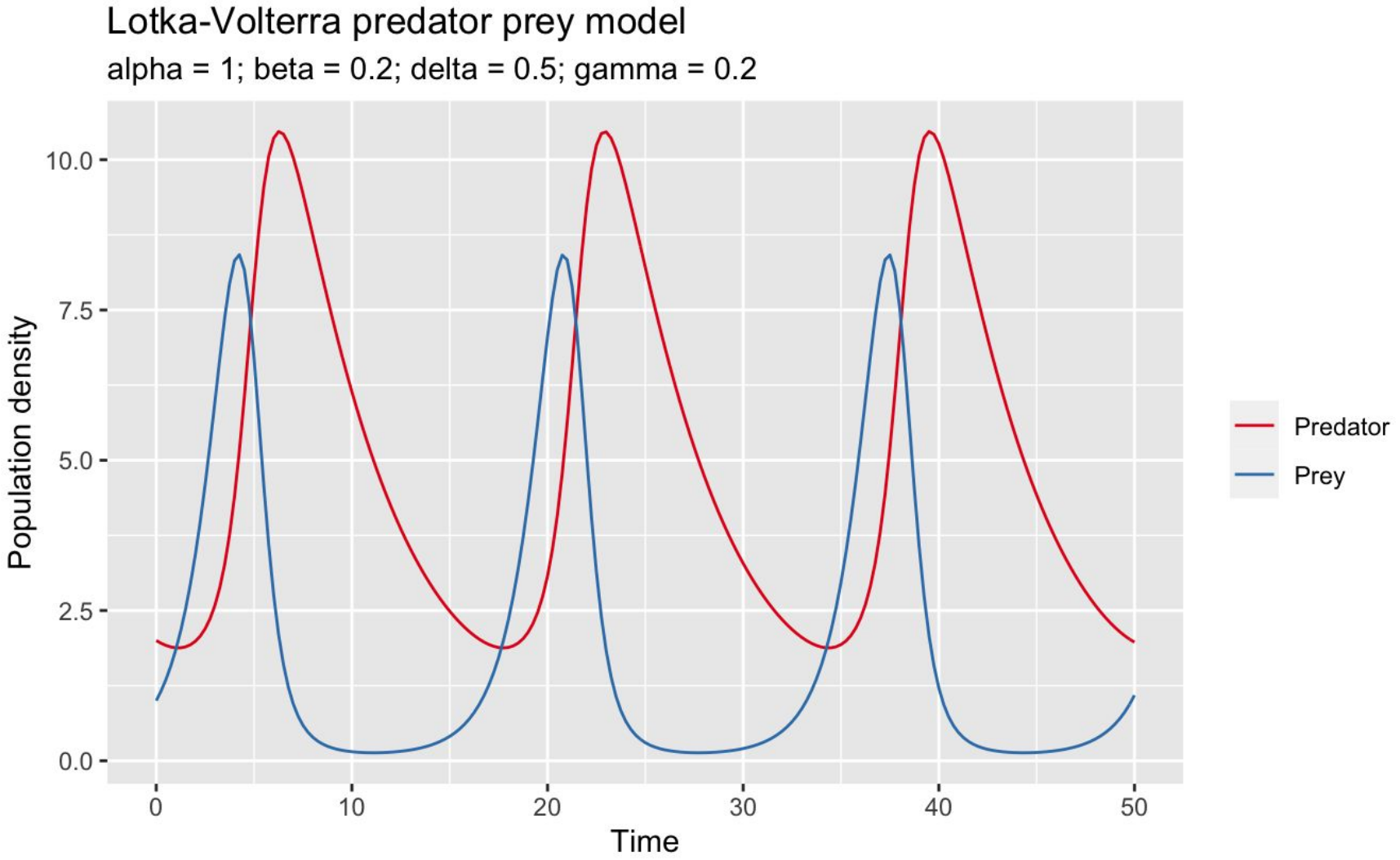


Lotka Volterra equations

$$\frac{dx}{dt} = A.y$$

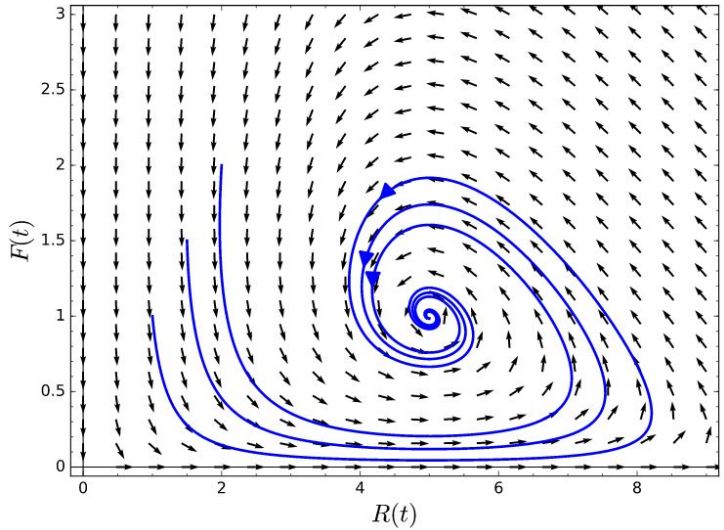
$$\frac{dy}{dt} = -B.x$$




Lotka-Volterra predator prey model
alpha = 1; beta = 0.2; delta = 0.5; gamma = 0.2
Population density
10.0
7.5
5.0
2.5
0.0
0
10
20
30
40
50
Time
Predator
Prey

Set the heartbeat of the player

This approach can be used to set the heartbeat of the patient to a particular level



https://youtu.be/p_di4Zn4wz4?t=1244

Other applications

- Analyzing heartbeats and oxygen levels of pilots in airplane simulations.
- Real time health monitoring to aid in times of accidents while using AR.
- Exercise - games
- https://arxiv.org/pdf/2108.08762.pdf Monitores heart rate and ECG for changing exercise game level