

A large flock of birds, possibly swallows, is captured in flight against a clear, deep blue sky. The birds are arranged in a loose V-formation, with many individuals visible, each showing dark wings and lighter underparts. The text 'Schwarmsimulation' is overlaid in a large, bold, white sans-serif font, and 'in Processing' is below it in a slightly smaller, bold, white sans-serif font.

Schwarmsimulation

in Processing

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Animationsprogrammierung, HS Fulda WS19/20

Aufbau von Schwärmen

- **Große Anzahl Individuen**
 - Vermeiden Zusammenstöße
 - Gemeinsame Richtung
 - Zusammenhalt der Gruppe

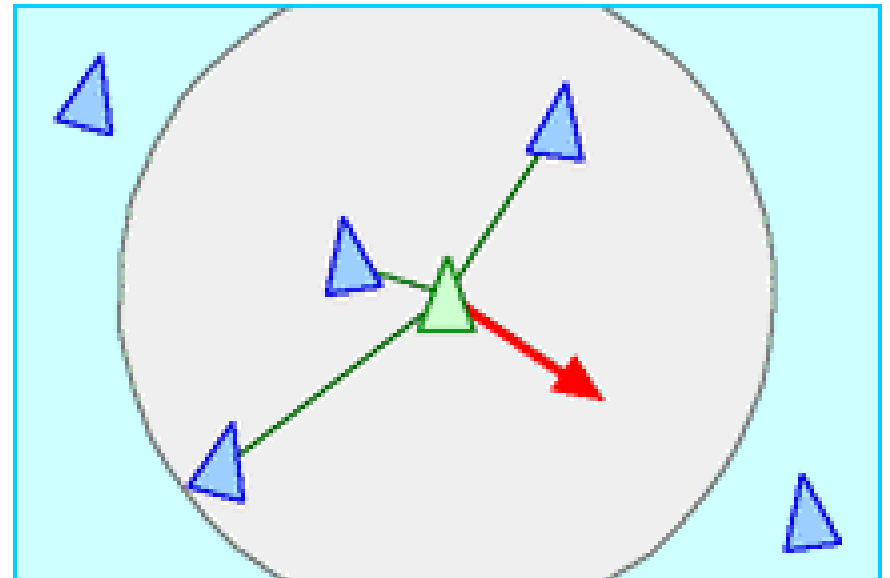
Individuum

```
class Fish:
    def __init__(self):
        self.pos = PVector(mouseX, mouseY)
        self.velocity = PVector(random(-5, 5), random(-5, 5))
        self.c = color(255, 255, 255)
```

- Eigene Position
- Eigene Richtung
- Eigene Geschwindigkeit
- (Eigene Farbe)

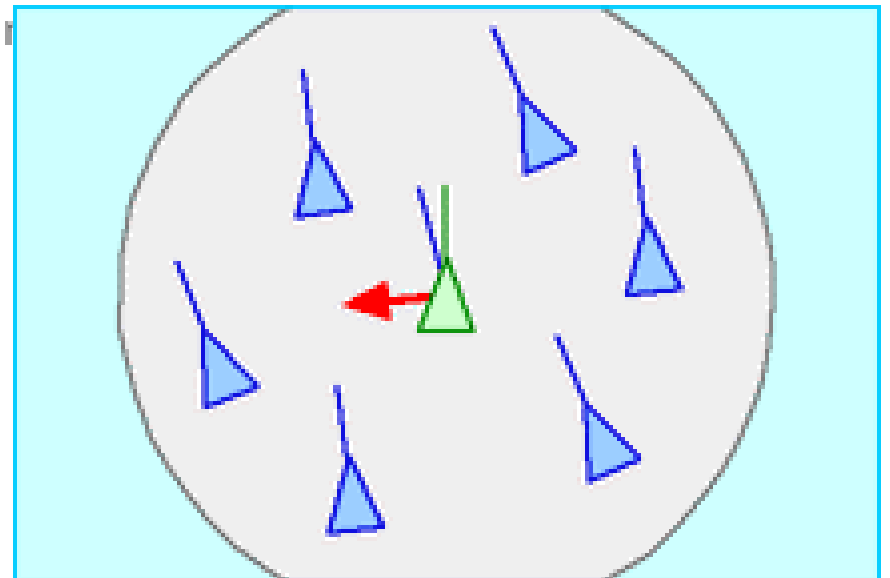
Regel 1/3 Separation

```
#return: Richtungsvektor der von Mittelpunkt der Kollisionen weg zeigt  
def avoiding(i, avoids, l):  
    v = PVector(0,0)  
    if rule1 == True and l > 0:  
        for a in avoids:  
            v.add(a.pos)  
    v.div(l)  
    v.sub(i.pos)  
    v.div(-1)  
    v.div(10) #Manuelle Anpassung  
    return v
```



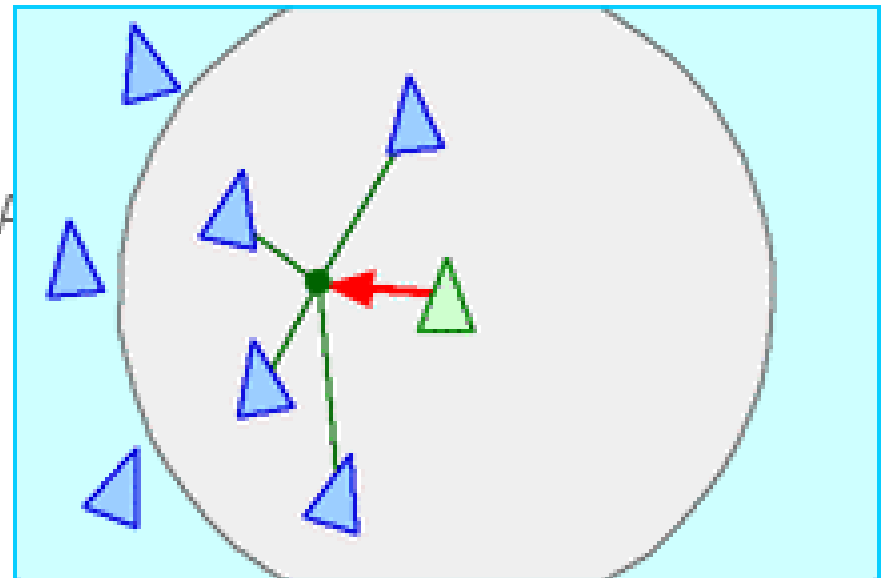
Regel 2/3 Alignment

```
#return: Direction+Speed der Gruppe als Richtungsvektor
def alignment(friends, l):
    v = PVector(0,0)
    if rule2 == True and l > 0:
        for f in friends:
            v.add(f.velocity)
        v.div(l)
        v.div(8) #Manuelle Anpassung
    return v
```



Regel 3/3 Cohesion

```
#return: Mittelpunkt der Gruppe als Richtungsvektor
def cohesion(i, friends, l):
    v = PVector(0,0)
    if rule3 == True and l > 0:
        for f in friends:
            v.add(f.pos)
        v.div(l)
        v.sub(i.pos)
        v.div(100) #Manuelle A
    return v
```



Quellen

- [1] <https://cs.stanford.edu/people/eroberts/courses/soco/projects/2008-09/modeling-natural-systems/boids.html>
- [Abb] <https://cs.stanford.edu/people/eroberts/courses/soco/projects/2008-09/modeling-natural-systems/boids.html>

**Viel Spaß
bei der Demo!**

Fragen und Anregung im Anschluss