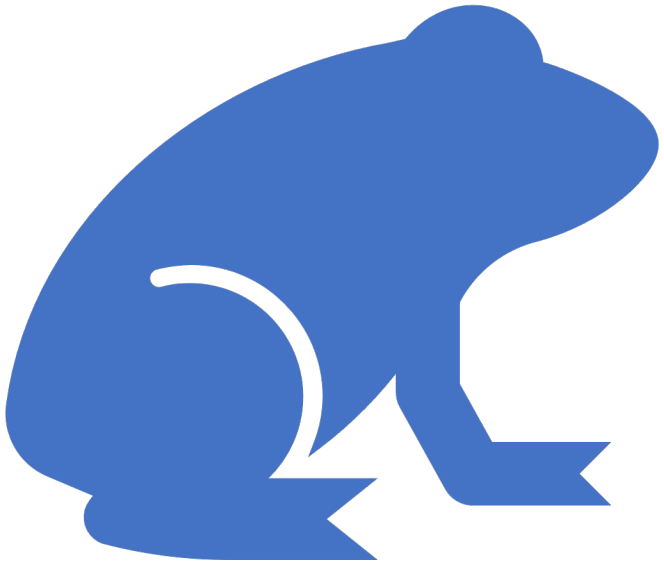


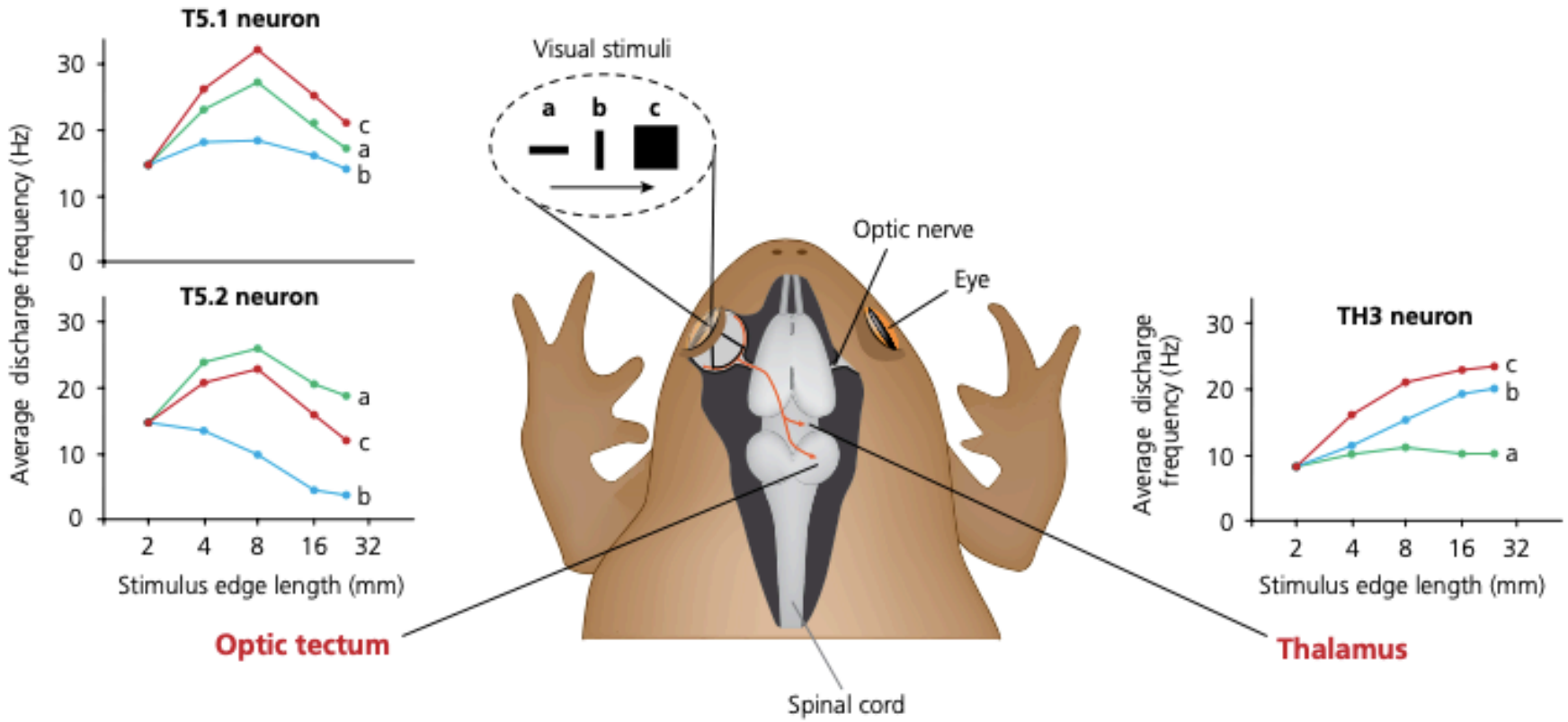
Visual Processing Model in Toads (10’)

Nghi Huynh

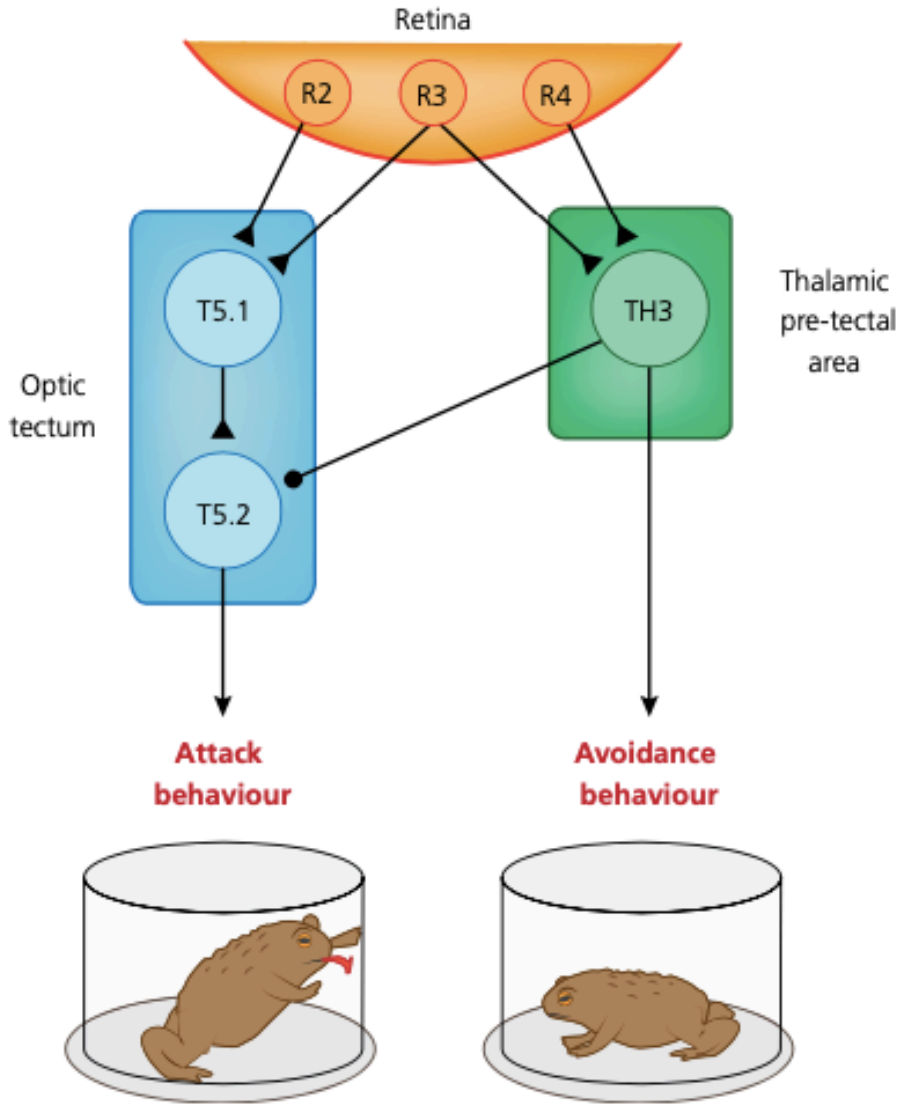
Rational (1’)

- How are prey stimuli distinguished from non-prey stimuli?
- What are the visual features of prey?

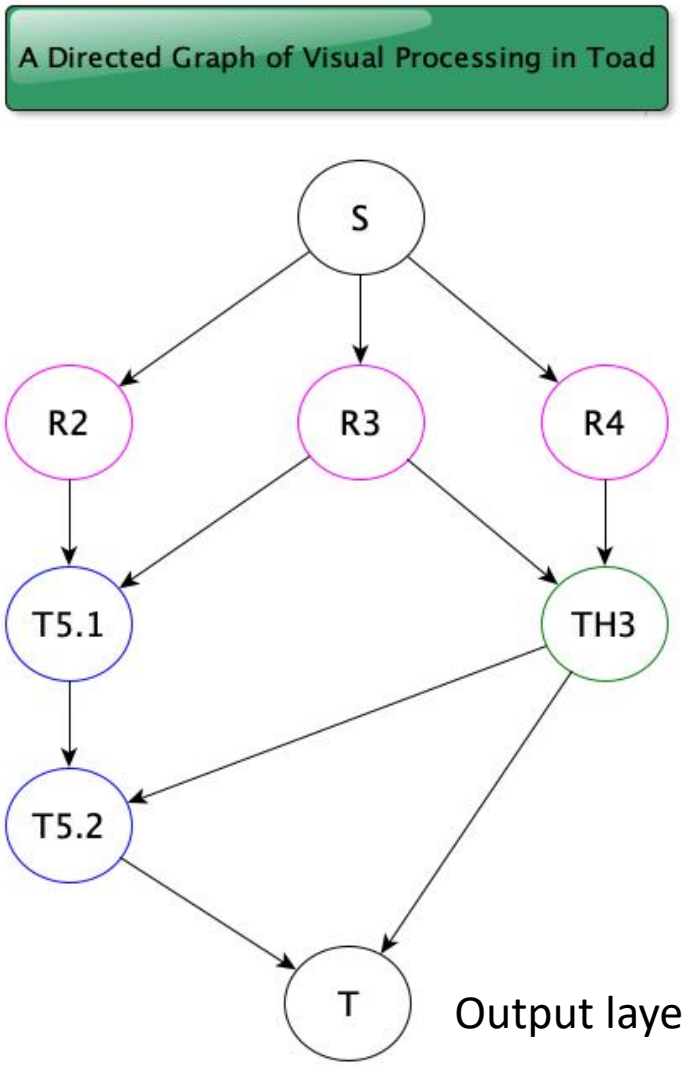
Background (2’): The visual pathway of a toad



A simplified model for prey-predation in toad



Algorithm (3'): Why directed graph?

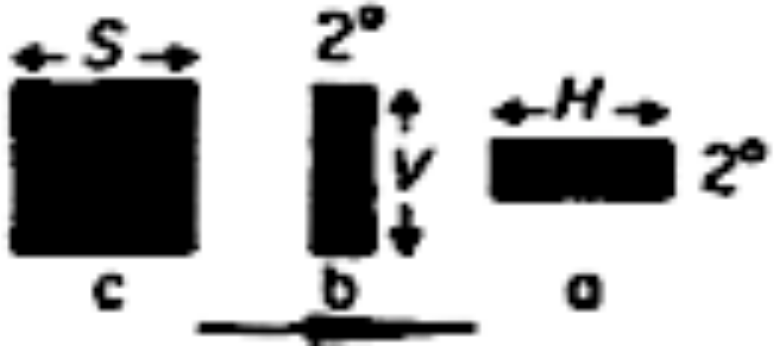


Retinal Layer

Tectal optic layer

Pretectal layer

Output layer



Input:

a) Rectangle moves in the direction of motion
b) Rectangle moves perpendicular to the direction of motion
c) Squares of different size

Output = {0,1}

- 0: attack
- 1: avoid

Mathematical description

- **A generator function**: to generate the responses of retinal ganglion cells (R2, R3, R4)

$$R_i = \kappa v^{\delta}$$

κ, δ: $constants$

v: $angular\ velocity$

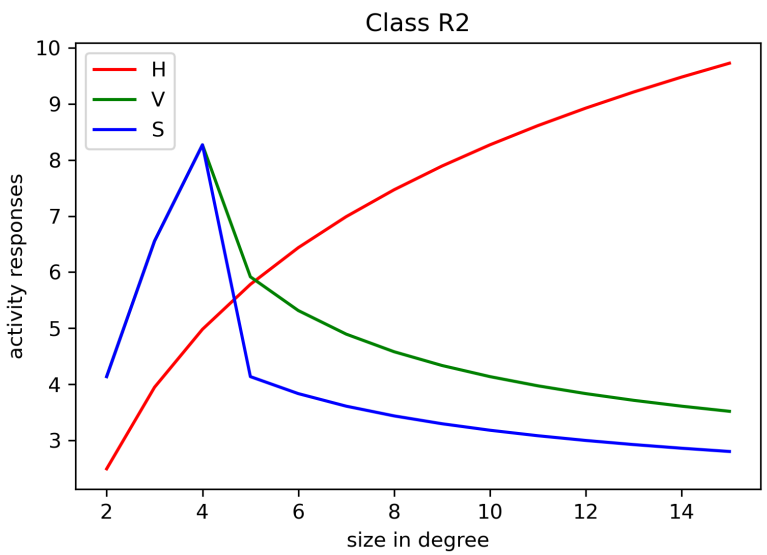
- **A weight function**: to calculate the weight of optic tectal (T5.1, T5.2) and pretectal (TH3) cells

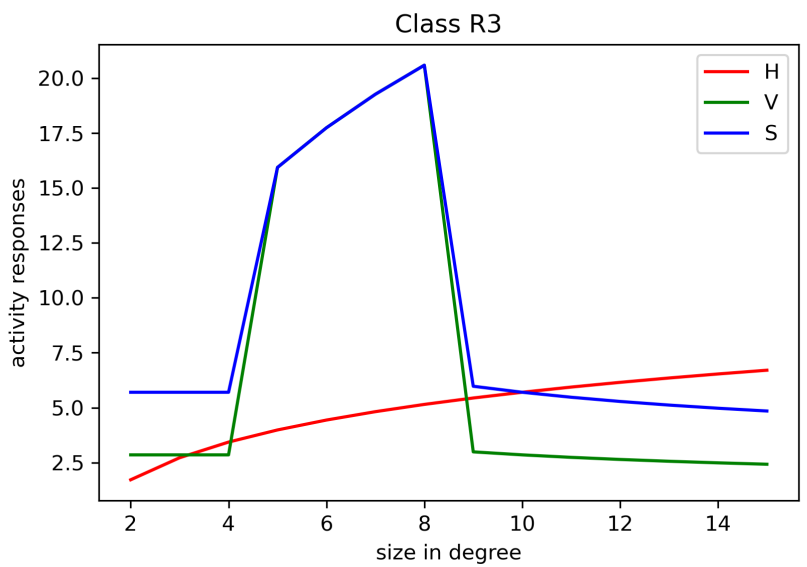
$$W_i = \sum E_i - \sum I_i$$

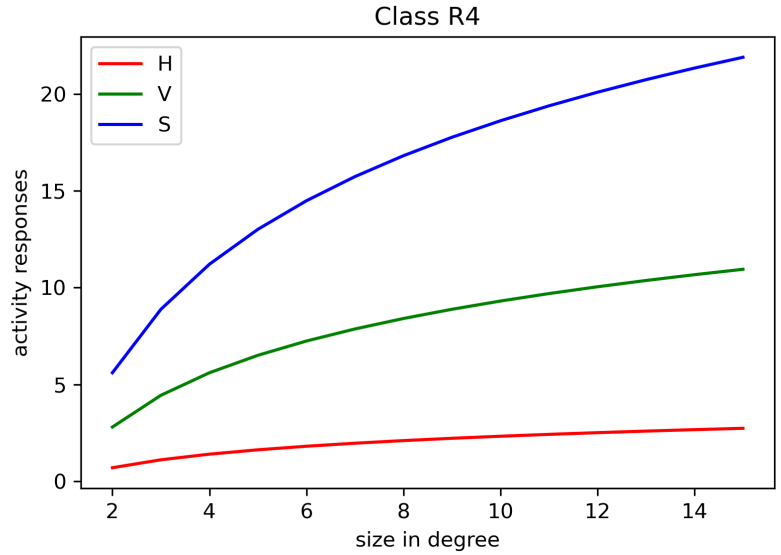
E_i: $excitatory\ input\ of\ cell\ type\ i$

I_i: $inhibitory\ input\ of\ cell\ type\ i$

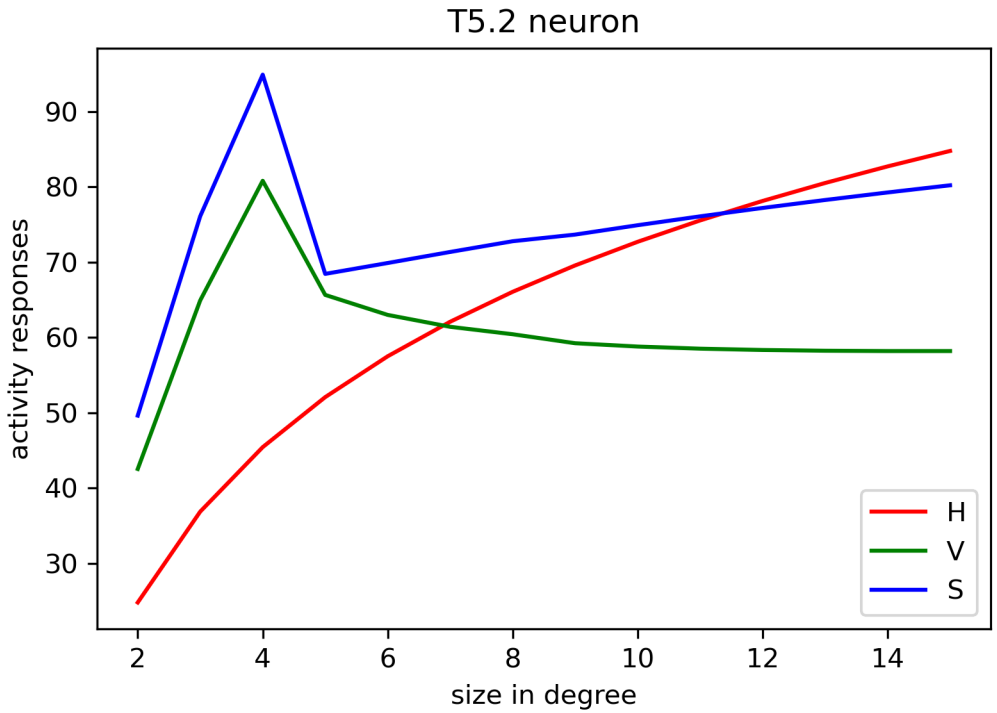
Results (3’): Responses of Retinal ganglion cells

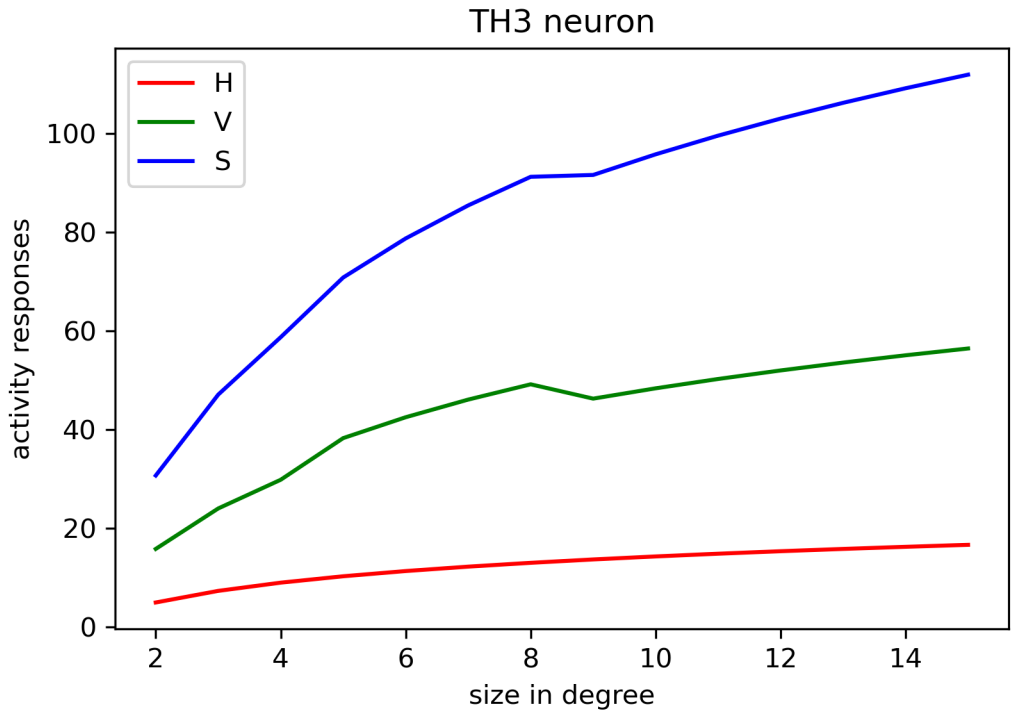






Responses of T5.2 neuron and TH3 neuron





Summary (1’):

- Attack behavior: retinal ganglion cells (R2, R3), optic tectal cells, especially T5.2.
- Avoidance behavior: retinal ganglion cells (R3, R4), pretectal cells- TH3
- Future application: test on multiple stimuli to predict the corresponding behavior