SIMonkey - Gelada baboons

Modelling social affiliation in gelada baboons

Frank Grossenbacher, Michael Heutschi, Derk Wild, Sofia Zbinden

Source: http://i.dailymail.co.uk/i/pix/2014/03/18/article-2583322-1C617AC600000578-563_964x643.jpg

Introduction - Social structure of gelada baboons

Source: National Geographic, Photo and caption by Brian Shuchuk: A moment captured during a trek in the Simien Mountains National Park, Ethiopia in November 2012.

Introduction - Social structure of gelada baboons

Grouping:

> Reproductive unit (harem)
> All-male unit

Females:

> Strong social bonds

Source: *http://en.wikipedia.org/wiki/Gelada* (09.12.14)

Introduction - Social structure of gelada baboons

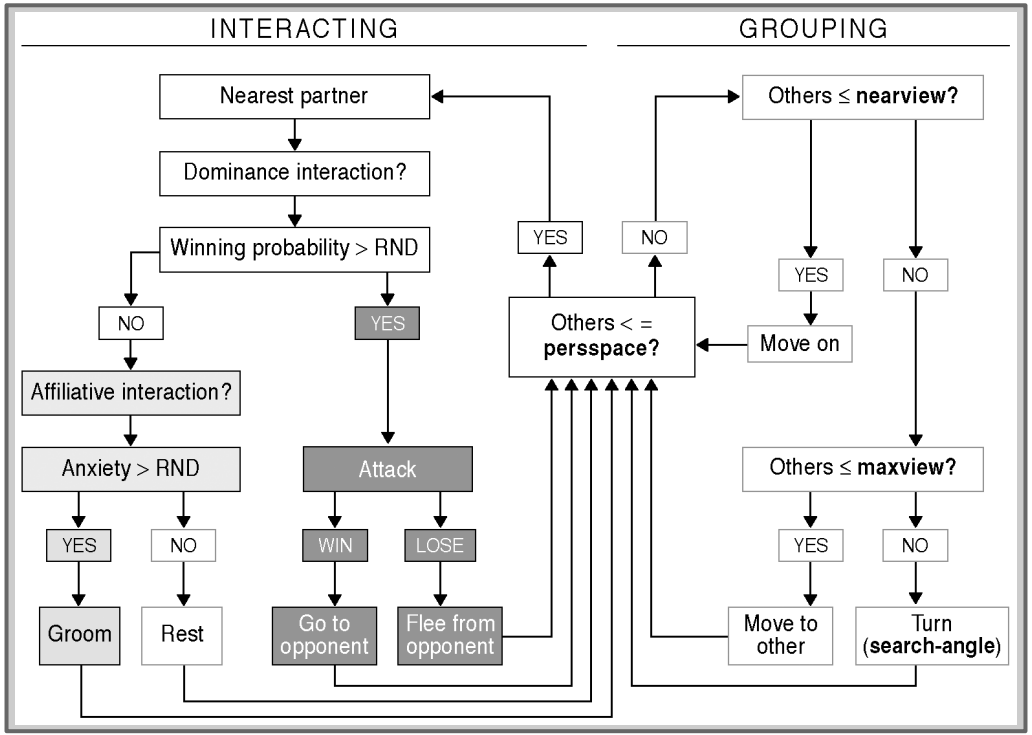
Grouping:
> Reproductive unit (harem)
> All-male unit

Females:
> Strong social bonds

Grooming:
> Social bonding
> Reducing anxiety & stress

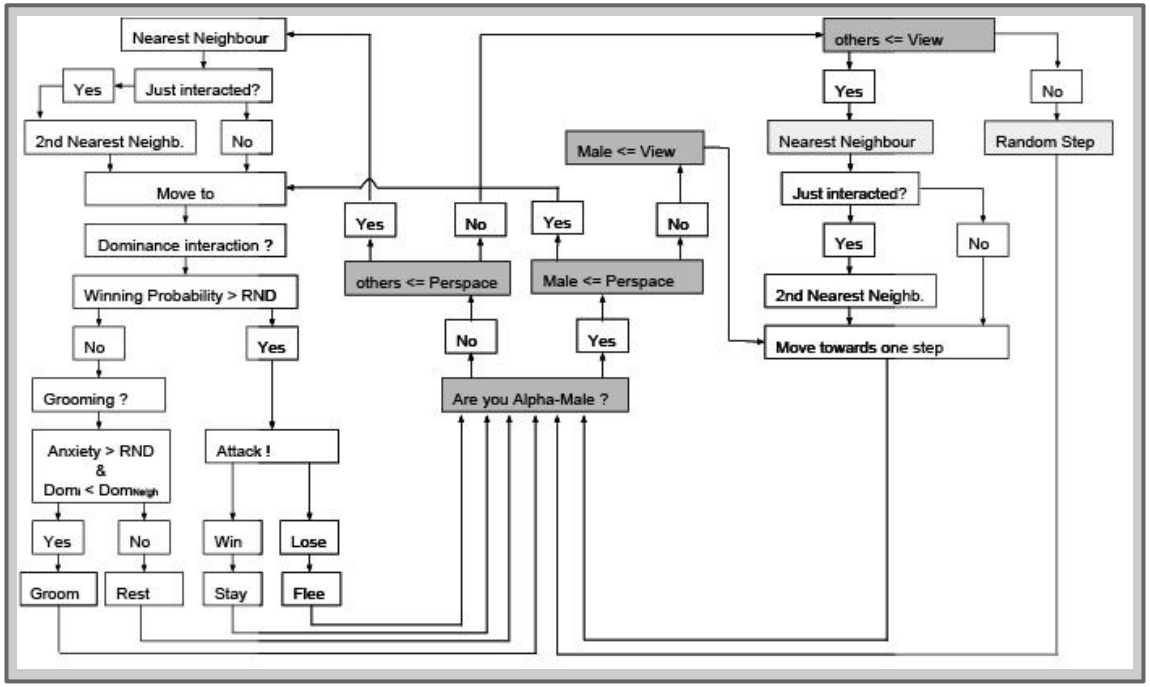
Source: *http://en.wikipedia.org/wiki/Gelada* (09.12.14)

Motivation - Model: GrooFiWorld



Source: Ivan Puga-Gonzalez, Hanno Hildenbrandt, and Charlotte K Hemelrijk. Emergent patterns of social affiliation in primates, a model. PLoS computational biology, 5(12):e1000630, 2009.

Model - SIMonkey



Structure of model SIMonkey illustrated by Derk Wild

Code

```
if (gender(i) == 1 && gender(nearest) == 1 && dom(i)/(dom(i)+dom(nearest)) >= rand) ||...
        (dom(i)/(dom(i)+dom(nearest)) >= rand && dom(i)/(dom(i)+dom(nearest)) >= rand)
    %%  6.1.1 fight
    % Attack
    % i = winner | nearest = loser
    if dom(i)/(dom(i)+dom(nearest)) >= rand
        winner = i;
        loser = nearest;
    else
        winner = nearest;
        loser = i;
    end
```

$$w_i = \begin{cases} 1 & , \frac{\mathrm{DOM}_i}{\mathrm{DOM}_i + \mathrm{DOM}_j} > \mathrm{RAND}(0,1) \\ 0 & , \mathrm{else} \end{cases}$$

Code

$$\mathrm{DOM}_i = \mathrm{DOM}_i + (w_i - \frac{\mathrm{DOM}_i}{\mathrm{DOM}_i + \mathrm{DOM}_j}) \cdot \mathrm{stepDOM}$$

$$\mathrm{DOM}_j = \mathrm{DOM}_j - (w_i - \frac{\mathrm{DOM}_j}{\mathrm{DOM}_i + \mathrm{DOM}_j}) \cdot \mathrm{stepDOM}$$

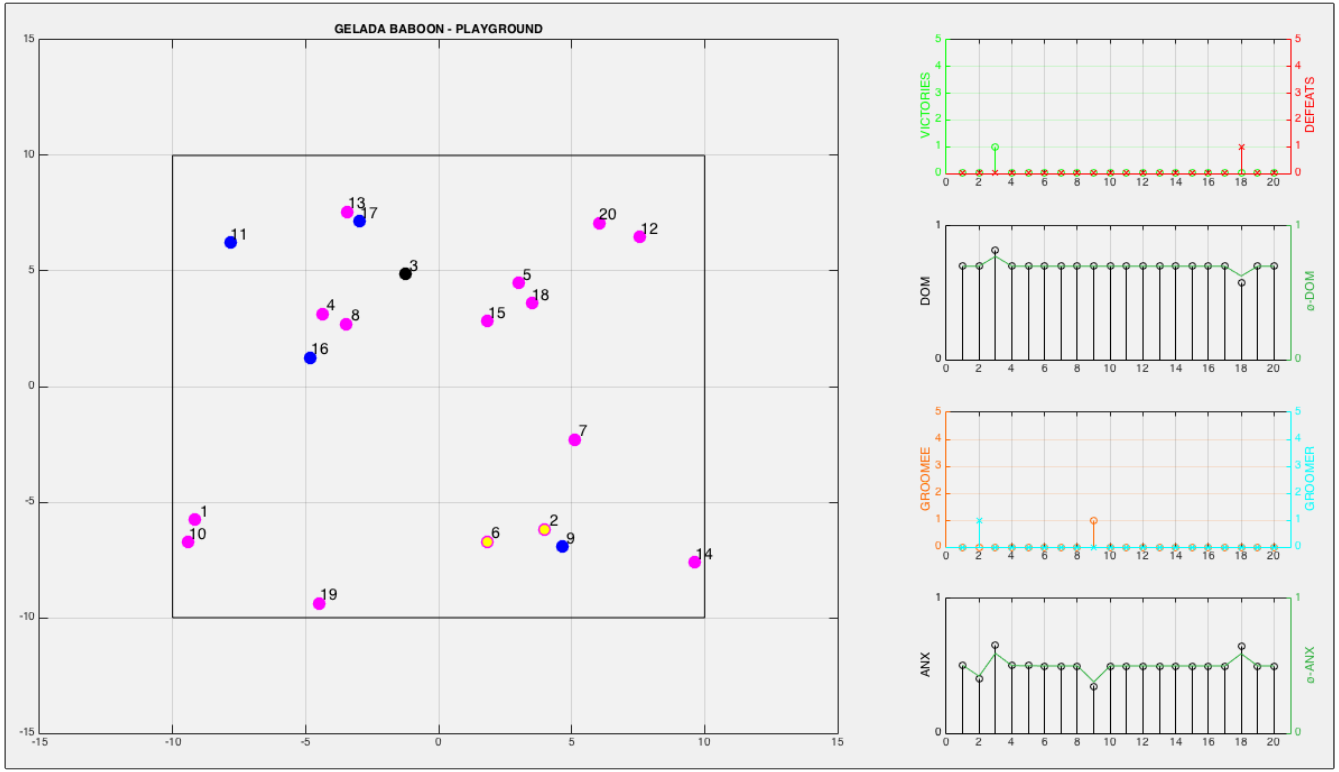
```
% Write new dominances
% represents intensity of interaction
dom_step = rand;
% dominance changes for the same amount
dom_t = (outcome(winner)-(dom(winner)/(dom(winner)+dom(loser))))*dom_step;
dom(winner) = dom(winner)+dom_t;
dom(loser) = dom(loser)-dom_t;
% anxiety grows anyway because of the fight
anx(winner) = anx(winner)+anx_inc_fight;
anx(loser) = anx(loser)+anx_inc_fight;
```

Code

```
% winner stays
rnd_direction = rand;
% loser of male-male fight flees
if gender(winner) == 1 && gender(loser) == 1
    xpos(loser) = move(xpos(winner),flee_dist,cos(2*pi*rnd_direction));
    ypos(loser) = move(ypos(winner),flee_dist,sin(2*pi*rnd_direction));
% loser of other fights flee
else
    xpos(loser) = move(xpos(winner),flee_dist*dom_step,cos(2*pi*rnd_direction));
    ypos(loser) = move(ypos(winner),flee_dist*dom_step,sin(2*pi*rnd_direction));
end

% gelada i remembers whith whom he just interacted
just_interacted(i) = nearest;
```

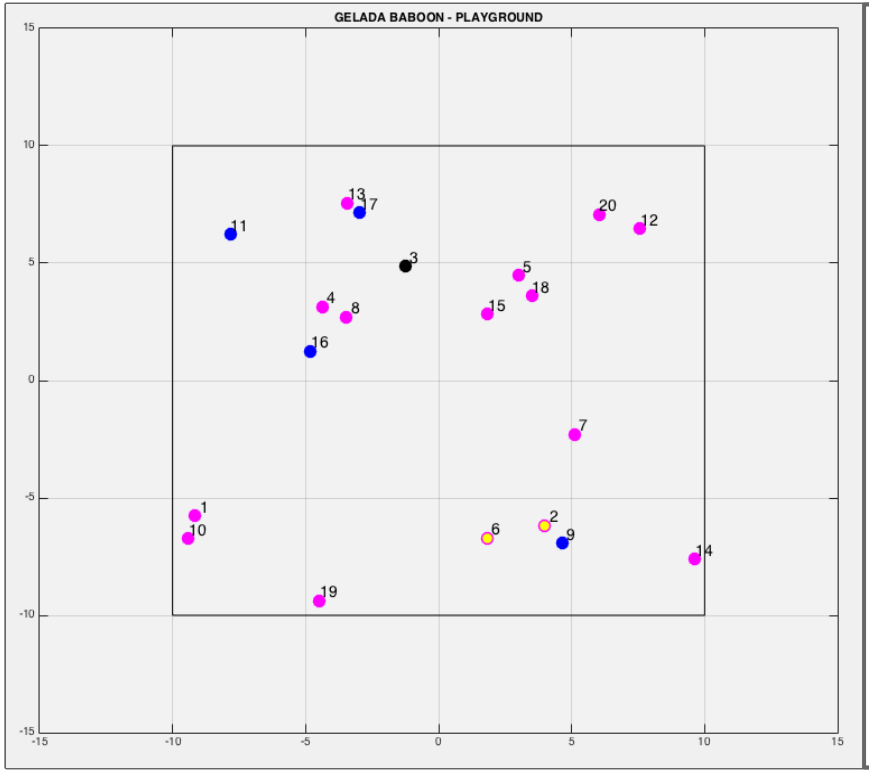
Plot - SIMonkey



MSSSM - SIMonkey

Frank Grossenbacher, Michael Heutschi, Derk Wild, Sofia Zbinden

Plot - Playground



- numbered apes
- female
- male
- interacting

MSSSM - SIMonkey
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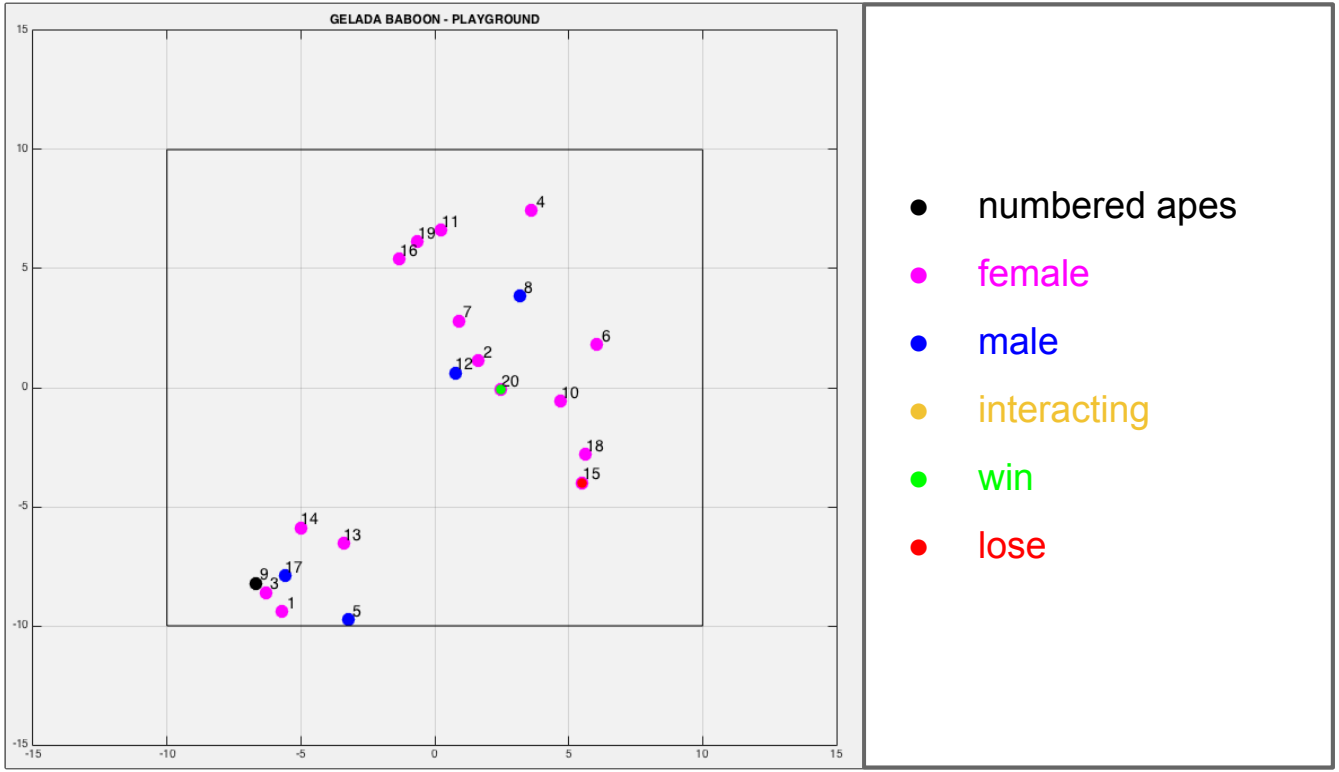
Plot - Playground



MSSSM - SIMonkey
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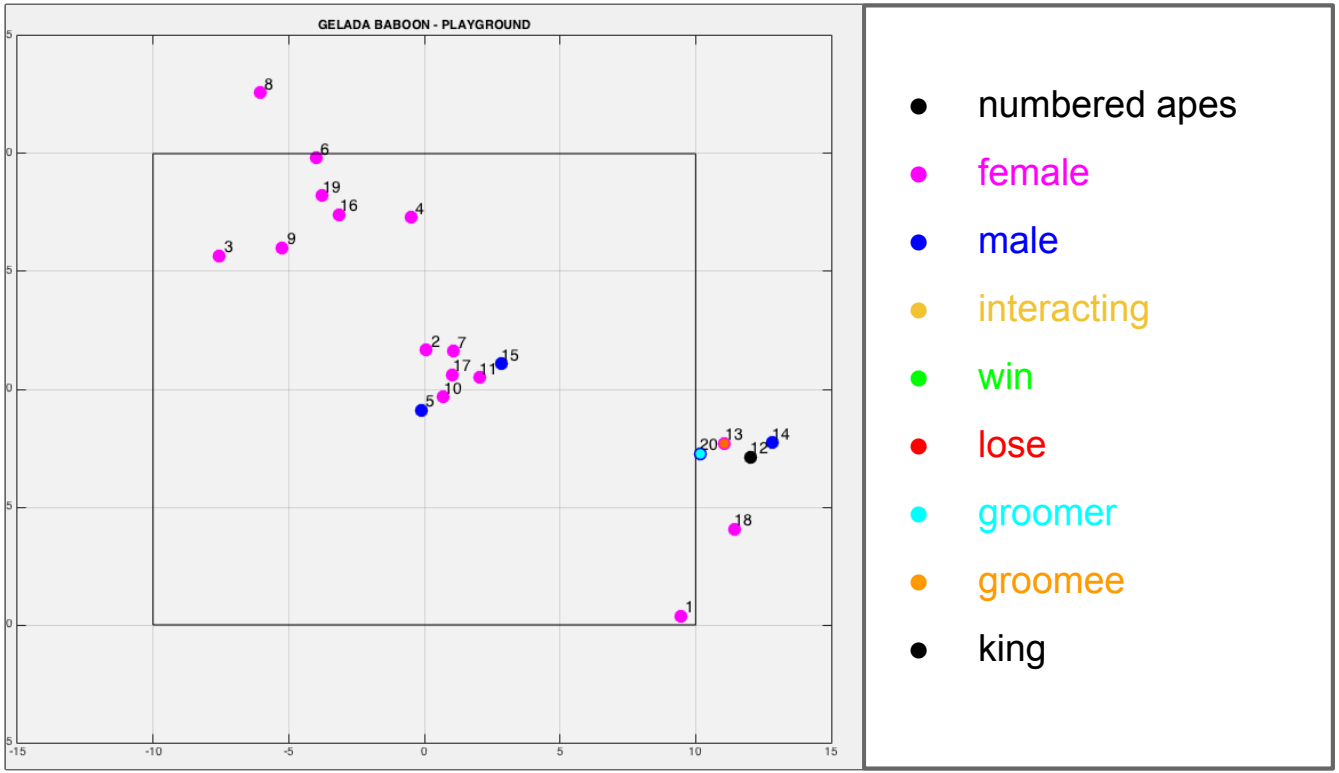
Plot - Playground



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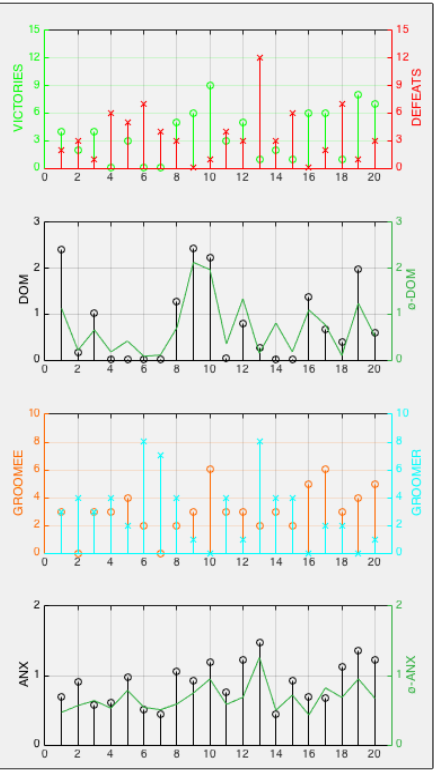
Plot - Statistics

- calculate number of victories
- calculate number of defeats

- present dominance
- average dominance

- calculate number of groomee
- calculate number of groomer

- present anxiety
- average anxiety



SIMonkey - live Plot

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