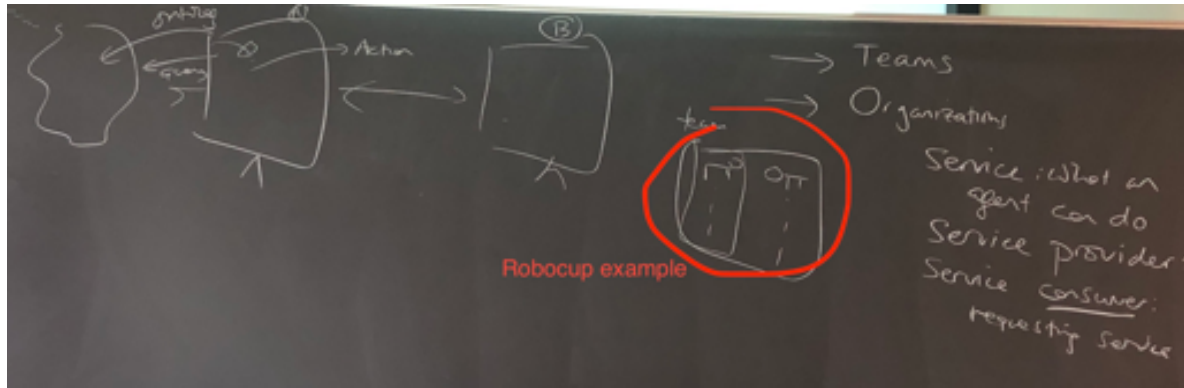


## L6 Trust in Multiagent Systems

- both are interested in A and B

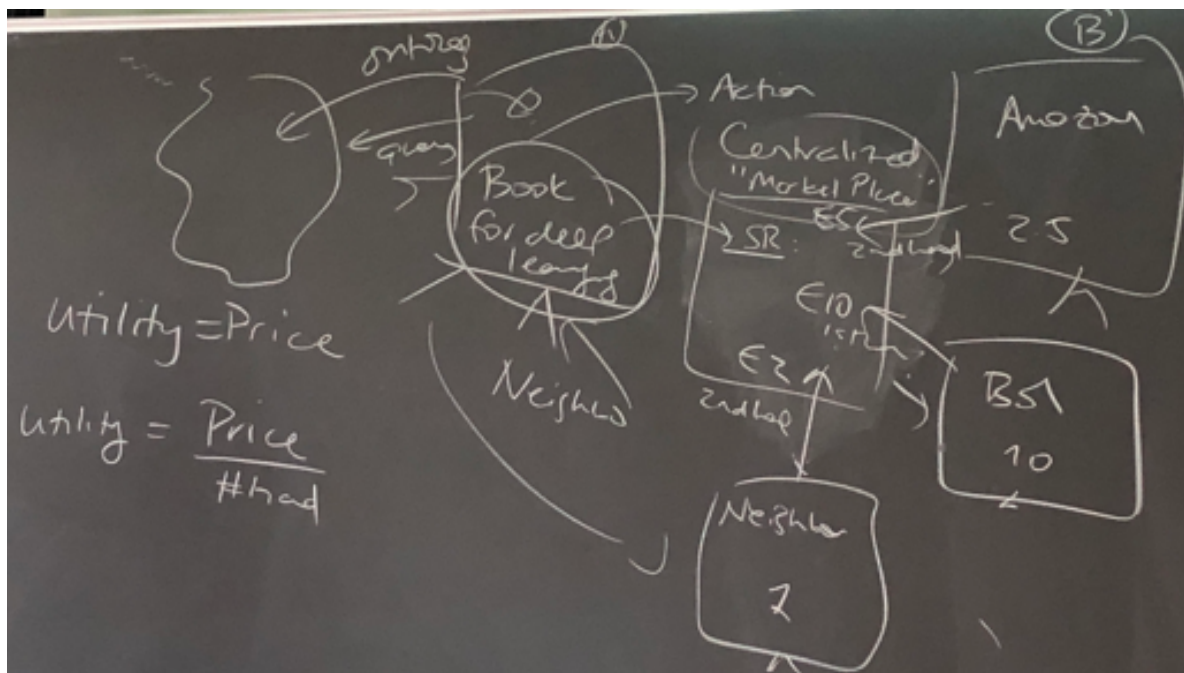


- Amazon example:

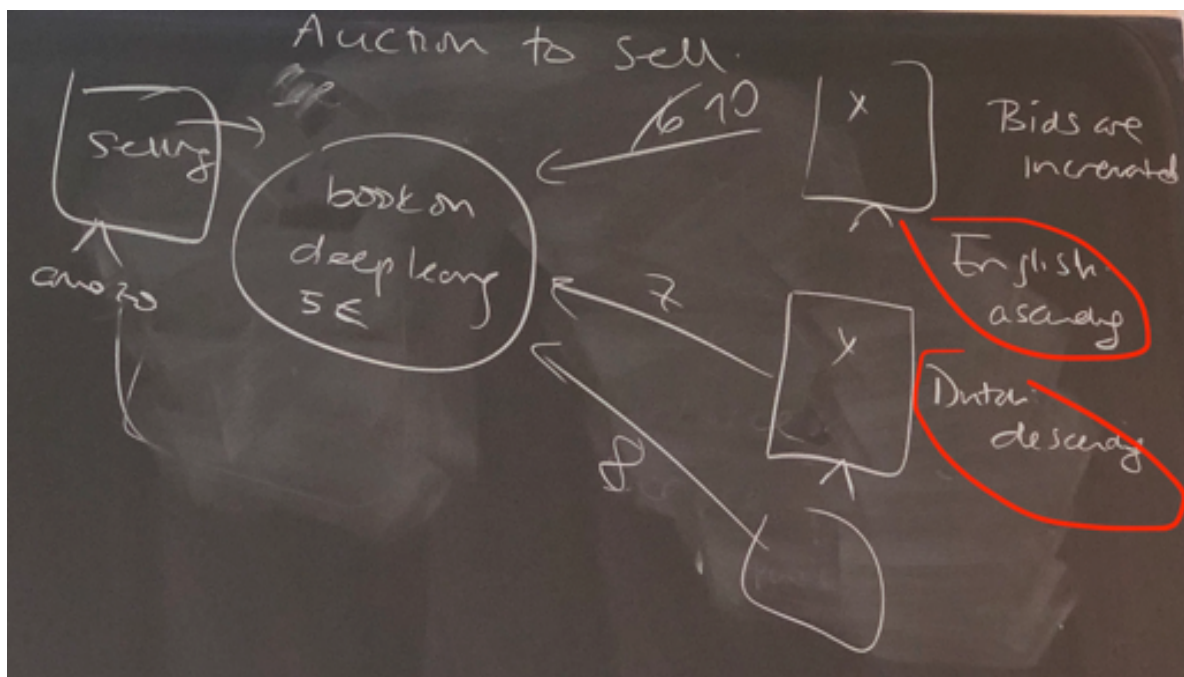


## Working together

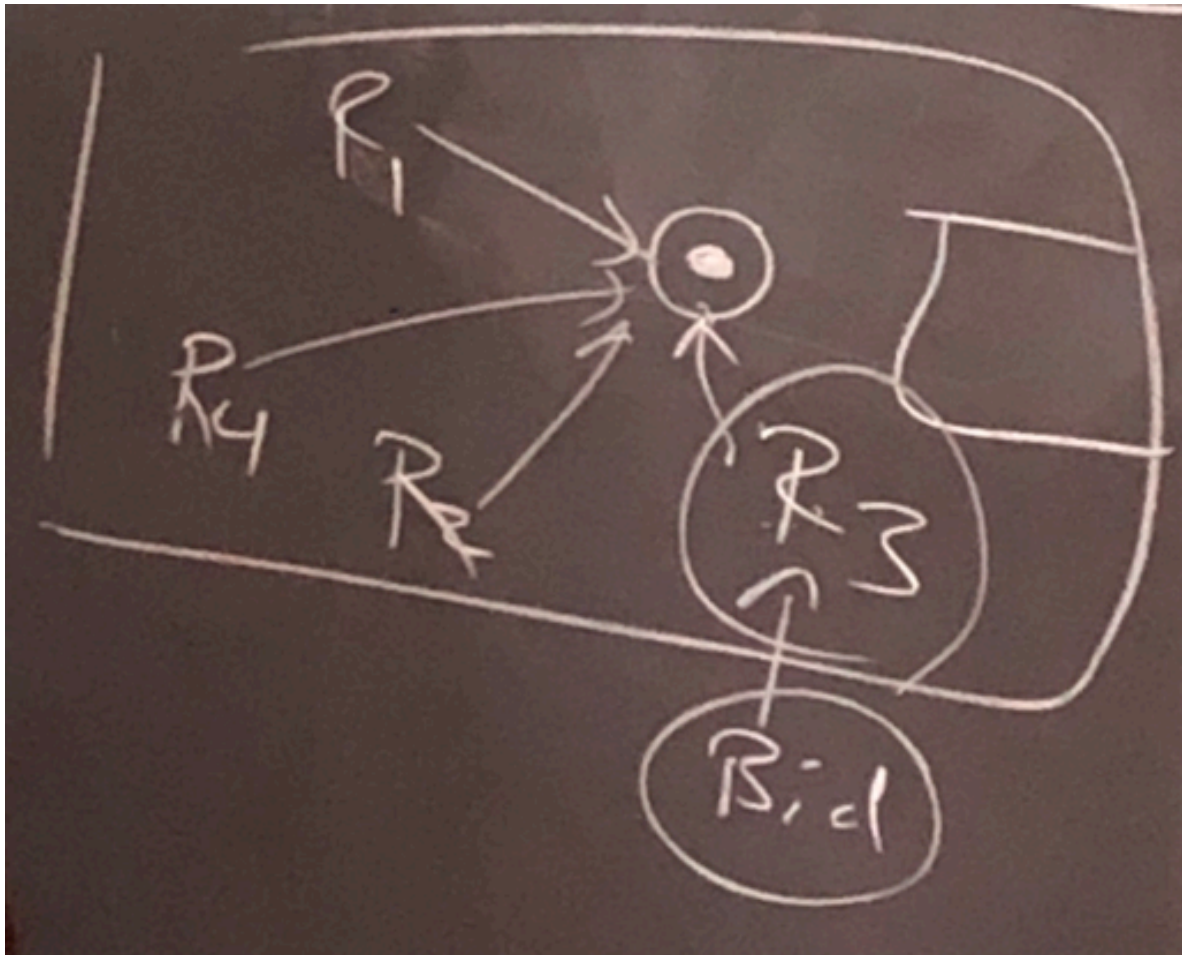
Economic service selection (;utility comes into play)



## Auctions



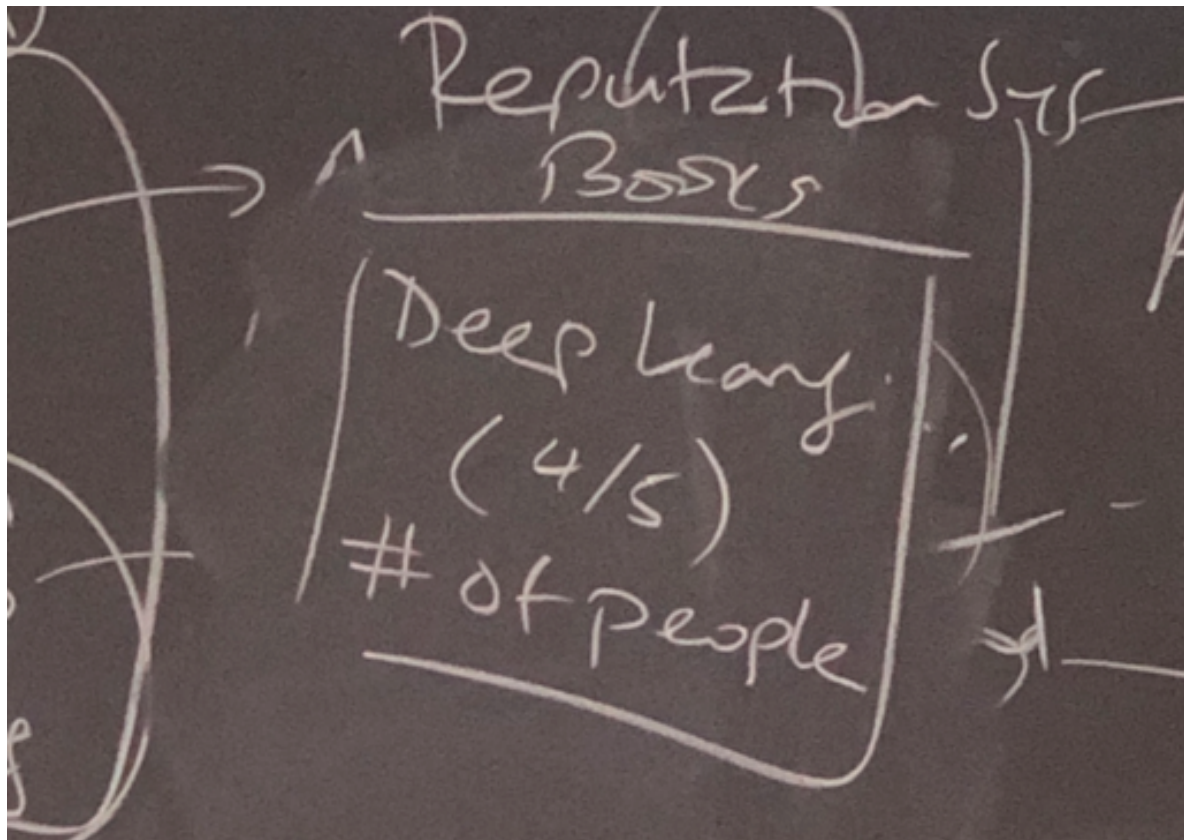
also, decision making in the "market place" (Robocup: who is closest to the ball):



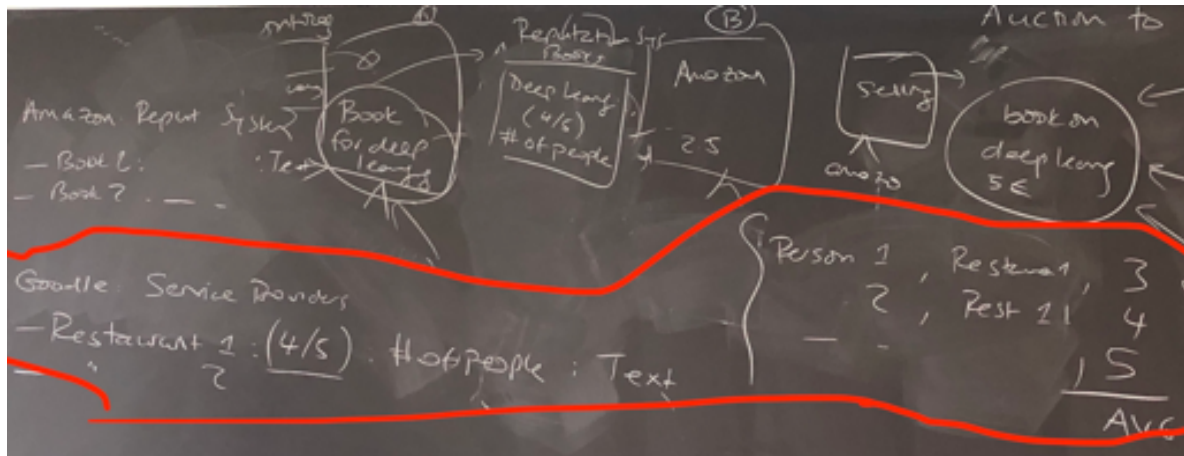
## Reputation

Amazon:

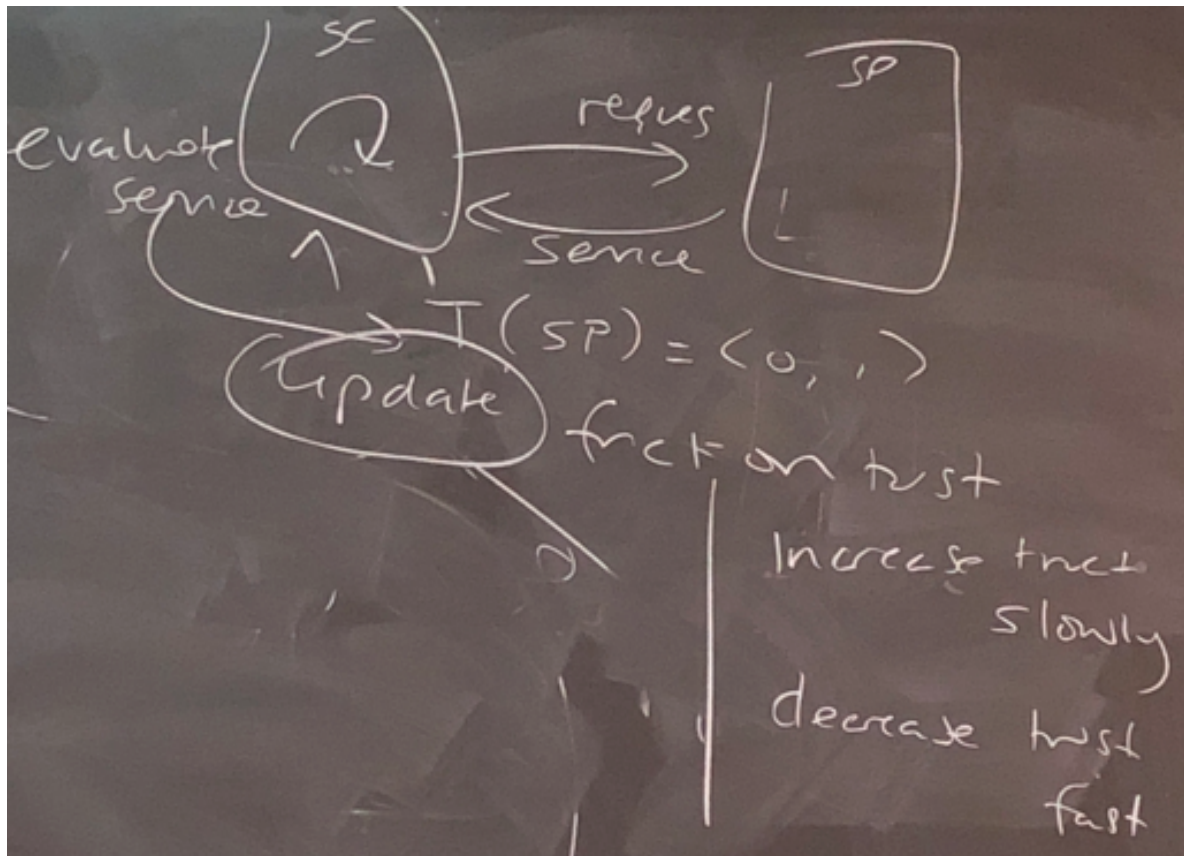




Google:



Computational trust



Local trust

You acquire trust through personal experience

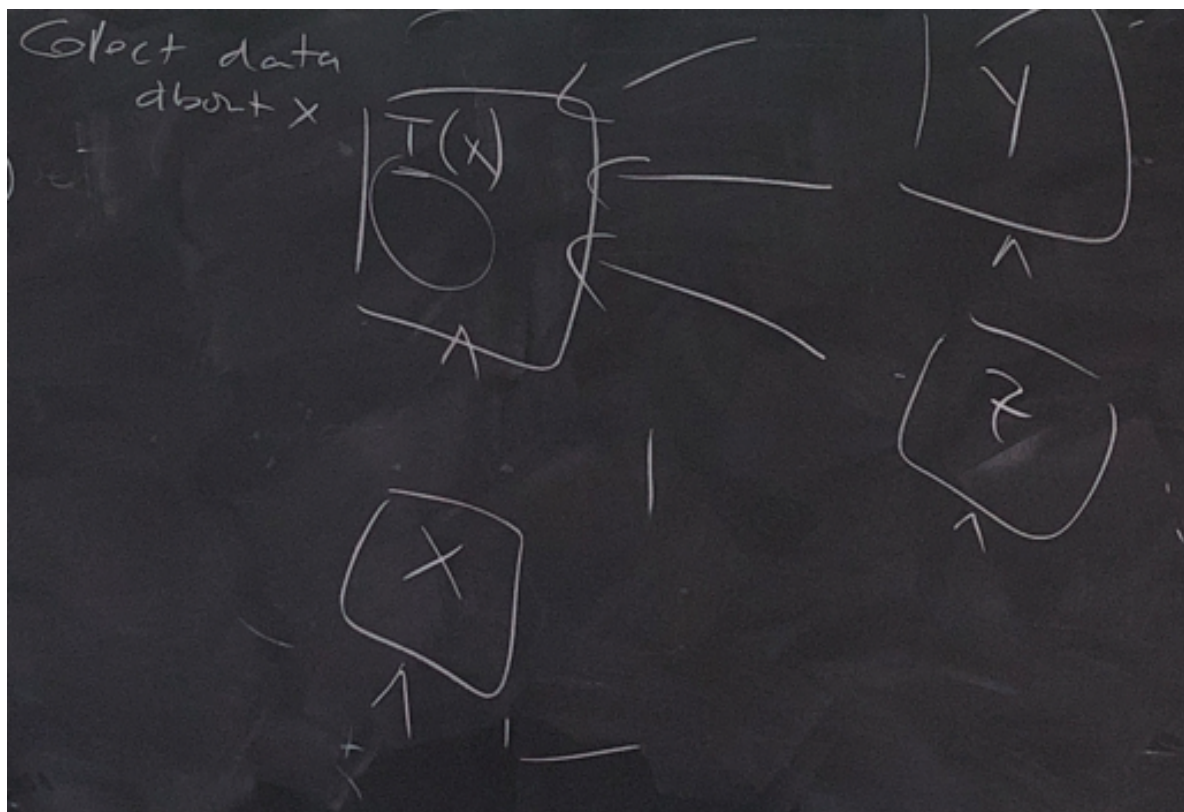
Institutional trust

You acquire trust through an institution / through an endorsement

Social trust

You acquire trust through evidence from others but not from a centralised location

## Beta-Reputation System



Data is collected, now prediction is made

Collect data about  $x$

$$\alpha = r + 1$$

$$\beta = s + 1$$

Example (we are calculating that it's more likely that more good things happen - 9 vs 3):

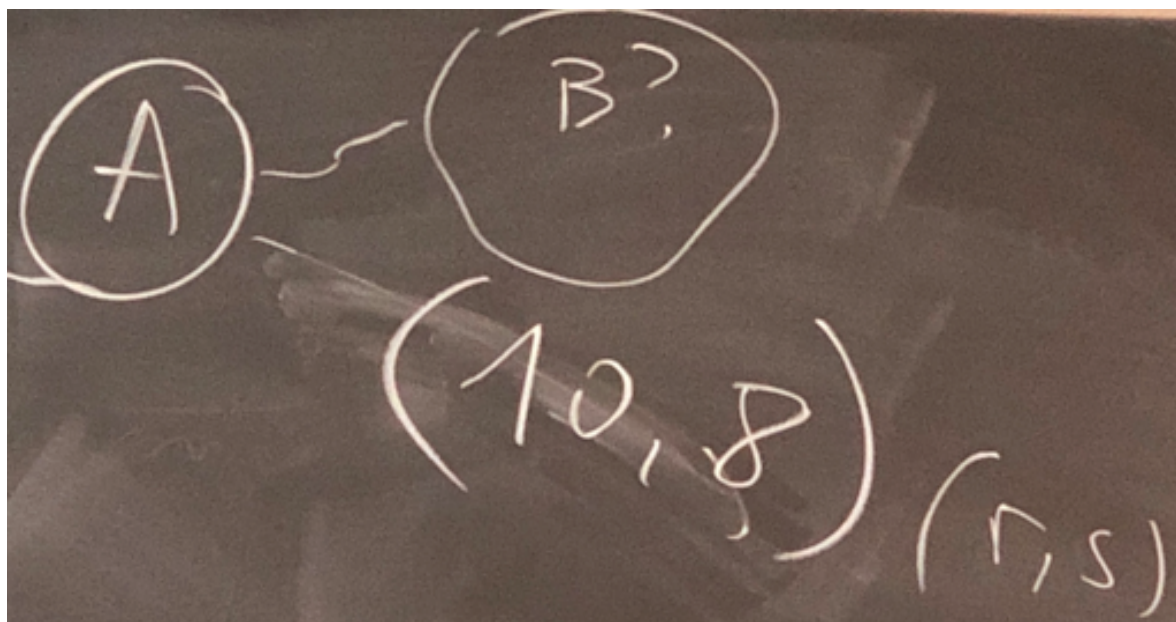


$$\begin{aligned} E(p) &= \frac{\alpha}{\alpha + \beta} \\ &= 9/12 = 0.75 \end{aligned} \quad \begin{aligned} \alpha &= r + 1 = 9 + 1 \\ \beta &= s + 1 = 5 + 1 \end{aligned}$$

Example 2 (Calculate T's reputation function by agent X...):  
(what is the probability of X trusting T)

$$E\left(\frac{p_T^X}{p_T}\right) = \frac{\left(\frac{r_T^X}{r_T + 1}\right)}{\left(\frac{r_T^X}{r_T + 1} + \frac{s_T^X}{s_T + 1}\right)}$$

B is gathering evidence (r,s) about A



B is assigning a reputation to A (and eventually Represents it on the scale between -1;1):

$$E\left(\frac{r_T^x}{p_T^x}\right) = \frac{(r_T^x + 1)}{(r_T^x + s_T^x + 1)}$$

$r_B^A = 10$   
 $s_B^A = 8$

$$E\left(\frac{r_B^A}{p_B^A}\right) = \frac{11}{20} = 0.55$$

$\text{Rep}(r_B^A, s_B^A) = (E\left(\frac{r_B^A}{p_B^A}\right) - 0.5) \times 2 = 0.1$

Combining feedback  
Representation of an opinion w:



$$w_y^x = (b_y^x, d_y^x, u_y^x)$$

$\uparrow$  belief     $\uparrow$  disbelief     $\uparrow$  uncertainty

$$= (0.3, 0.4, 0.3)$$

$$= (0.1, 0.2, 0.7)$$

$$w_y^x = (0.6, 0.3, 0.1)$$

$$\text{Rep}(w_y^x) = (0.6, 0.1, 0.3)$$

~~A = 10~~  
~~B = 10~~  
~~C = 10~~  
~~D = 10~~