RATIONAL RITUAL

CULTURE , COORDINAT ION , AND COMMON KNOWLEDGE

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In "**coordination problems**," each person wants to participate in a joint action only if *others* participate also. For example, each person might want to take part in an antigovernment protest but only if there are *enough total protesters*.

One way to coordinate is simply to communicate a message, such as "Let's all participate." But because each person will participate only if others do, *for the message to be successful, each person must not only know about it, each person must know that each other person knows about it.*

Social integration and political change can both be understood as coordination problems; I am more likely to support an authority or social system, either existing or insurgent, the more others support it.

Public rituals, rallies, and ceremonies generate the necessary common knowledge.
A public ritual is not just about the transmission of meaning from a central source to each member of an audience; it is also about letting audience members *know what other audience members know*.

Buying certain kinds of goods can be a coordination problem; for example, a person might want to see a movie more the more popular it is. To get people to buy these "coordination problem" goods, an advertiser should try to generate common knowledge.

Evidence from regular prime-time television commercials suggests that *popular shows are able to charge advertisers more per viewer for commercial slots, because popular shows better generate common knowledge* (when I see a popular show, I know that many others are also seeing it).

An example You are standing near the front door of a bus and I am near the back door. I notice a mutual acquaintance, who yells from the sidewalk. Joining this acquaintance would be nice, but we care mainly about each other's company: I want to get off only if you get off and you want to get off only if I get off. The bus doors open; separated by the crowd, we must decide independently whether to get off.

Say that when our acquaintance yells out, I look for you but cannot find you; I'm not sure whether you notice her or not and thus decide to stay on the bus. Maybe we both know that our acquaintance yelled, but I do not know that you heard.

Say that when our acquaintance yells, I see you raise your head and look around for me, but I'm not sure if you manage to find me. Even though I heard the yell, and I know that you heard since I see you look up, I still decide to stay on the bus because I do not know that you know that I heard.

Αφού σε είδα να με αναζητάς και άρα ξέρω ότι έχεις ακούσει:
σού κάνω κάποιο κατάλληλο νόημα – στο οποίο εσύ θα ανταποκριθείς, ώστε

(1) να καταλάβω, ότι ξέρεις ότι έχω ακούσει την φωνή

(2) να καταλάβεις, ότι ξέρω ότι έχεις ακούσει την φωνή

Γενίκευση του (1)

Θεωρώντας τον παίκτη 'you' ως εκπρόσωπο ενός ευρύτερου συνόλου (παρέας) με το οποίο θα ήθελε να συντονιστεί ο παίκτης 'I' , προκύπτει η ακόλουθη γενίκευση της συνθήκης (1) :

(1B) Πώς θα μπορούσα να μάθω άν:
υποθέτεις ότι θεωρείται γενικώς αποδεκτό ότι έχω ακούσει την φωνή;

Game - payoffs

The worst thing for me would be if I got off and you stayed on, because I would feel bad about having a drink without you being there.

If I stay on the bus, I get the "status quo" utility of 4, regardless of whether you get off or not.

	you get off	**you stay on**
I get off	6 , **6**	0 , **4**
I stay on	4 , **0**	4 , **4**

Τα ζεύγη επιλογών: (I get off , **you get off**)

(I stay on , **you stay on**)

είναι οι «καταστάσεις ισορροπίας» για το παίγνιο: κανείς από τους παίκτες δεν θα κέρδιζε αλλάζοντας την επιλογή του, με δεδομένο ότι ο άλλος παίκτης δεν αλλάζει επιλογή.

Για το παρακάτω υποθετικό παίγνιο, δεν υπάρχει ζεύγος επιλογών

που να είναι «κατάσταση ισορροπίας».

	you get off	**you stay on**
I get off	6 , **4**	6 , **5**
I stay on	5 , **6**	7 , **4**

Για το παρακάτω παίγνιο, το ζεύγος επιλογών

(I stay on , **you stay on**) είναι η *μοναδική* «κατάσταση ισορροπίας».

	you get off	**you stay on**
I get off	6 , **6**	0 , **7**
I stay on	7 , **0**	4 , **4**

Kripke model - we are facing each other

States

	s1	I'm awake, you're awake
	s2	I'm awake, you're asleep
	s3	I'm asleep, you're awake
	s4	I'm asleep, you're asleep

Primitive propositions

I'm awake	is true at states	s1 , s2
you're awake	is true at states	s1 , s3

Possibility relations $s3 \approx_{me} s4$ $s2 \approx_{you} s4$

Events are sets of states

Event[**φ**] = { x : η φόρμουλα φ αληθεύει στην κατάσταση x }

" φ " *occurs* at the set of states { x : η φόρμουλα φ αληθεύει στην κατάσταση x }

Event[I'm awake] = { s1 , s2 }

" I'm awake " *occurs at states* s1 , s2

Event[you're awake] = { s1 , s3 }

" you're awake " *occurs at states* s1 , s3

Event[we're both awake] = { s1 }

" we're both awake " *occurs at state* s1

Event[one of us is awake] = { s1 , s2 , s3 }

" one of us is awake " *occurs at states* s1 , s2 , s3

I'm awake **is true at states** **s1 , s2**

you're awake **is true at states** **s1 , s3**

$s3 \approx_{me} s4$ **$s2 \approx_{you} s4$**

Event[I know Ω] = { x : Ω occurs at every state z such that $z \approx_{me} x$ }

Event[you know Ω] = { x : Ω occurs at every state z such that $z \approx_{you} x$ }

Event[I know you're awake] = { s1 }

Event[you know that I'm awake = { s1 }

Event[I know that you know that I'm awake] =

= { x : " you know that I'm awake " occurs at every state z such that $z \approx_{me} x$ }

= { x : if z is such that $z \approx_{me} x$, then z is s1 } = { s1 }

Event[you know that I know you're awake] =

= { x : " I know you're awake " occurs at every state z such that $z \approx_{you} x$ }

= { x : if z is such that $z \approx_{you} x$, then z is s1 } = { s1 }

Coordination - we are facing each other

Επιλογές των παικτών σε κάθε μία κατάσταση του μοντέλου Kripke

s1	I'm awake, you're awake	a	**b**
s2	I'm awake, you're asleep	I stay on	**you stay on**
s3	I'm asleep, you're awake	I stay on	**you stay on**
s4	I'm asleep, you're asleep	I stay on	**you stay on**

<u>At state "I'm awake, you're awake"</u>:

If one of us got off and the other stayed on, the situation would be "unstable" because one of us would want to change her action.

Hence the two possibilities are that either ***we both get off*** or ***we both stay on***.
Both of these situations are "<u>equilibria</u>" in that neither person, given the other person's actions, would choose to do something different.

Kripke model - you are facing away from me

Event[I'm awake] = { s1 , s2 }

Event[you're awake] = { s1 , s3 }

s1 I'm awake, you're awake

s2 I'm awake, you're asleep

s3 I'm asleep, you're awake

s4 I'm asleep, you're asleep

Possibility relations $s3 \approx_{me} s4$

$s1 \approx_{you} s3$ $s2 \approx_{you} s4$

Event[I know you're awake] = { s1 }

Event[you know that I'm awake] = { }

Event[I know that you know that I'm awake] =

= { x : " you know that I'm awake " occurs at every state z such that $z \approx_{me} x$ }

= { x : if z is such that $z \approx_{me} x$, then $z \in \{ \}$ } = { }

Event[you know that I know you're awake] =

= { x : " I know you're awake" occurs at every state z such that $z \approx_{you} x$ }

= { x : if z is such that $z \approx_{you} x$, then z is s1 } = { }

Coordination - you are facing away from me

	you get off	**you stay on**
I get off	6 , **6**	0 , **4**
I stay on	4 , **0**	4 , **4**

Επιλογές των παικτών σε κάθε μία κατάσταση του μοντέλου Kripke

s3 ≈ $_{me}$ s4 **s2 ≈ $_{you}$ s4** **s1 ≈ $_{you}$ s3**

s1	I'm awake, you're awake	a	**b**
s2	I'm awake, you're asleep	I stay on	**you stay on**
s3	I'm asleep, you're awake	I stay on	**b**
s4	I'm asleep, you're asleep	I stay on	**you stay on**

Prob { state is s1 } = Prob { state is s2 } = Prob { state is s3 } = Prob { state is s4 } = 1/4

The following expected values and probabilities
are *conditioned on the event* " you're awake " .

Prob { state is s1 | " you're awake " } = Prob { state is s3 | " you're awake "} = 1/2

b is 'you stay on' : Your expected payoff is **4**

b is 'you get off' :

a is 'I stay on'

Your expected payoff is Prob { state is s3 } × 0

+ Prob { state is s1 } × 0 = **0**

a is 'I get off '

Your expected payoff is Prob { state is s3 } × 0

+ Prob { state is s1 } × **6** = 1/2 × **6** = **3**

You decide to stay on

At state “I’m awake, you’re awake”:

If one of us got off and the other stayed on, the situation would be “unstable” because one of us would want to change her action. Hence the two possibilities are that either ***we both get off*** or ***we both stay on***.

Since you decide to stay on, ***I decide to stay on*.**

This is the only “equilibrium” in the case in which you face away.

Σχετικό εκπαιδευτικό υλικό

Michael Chwe *Rational Ritual_Culture, Coordination, and Common Knowledge*
Appendix

Fagin – Halpern – Moses – Vardi *Reasoning About Knowledge*
Ενότητα 2.5. An Event-Based Approach

Προτεινόμενες ασκήσεις

1 Έστω το *Kripke model* - we are facing each other.

a Για κάθε ένα από τα παρακάτω events (όπου οι εκφράσεις 'I know' , 'you know' έχουν την φυσική τους έννοια), βρείτε το αντίστοιχο σύνολο όλων των καταστάσεων όπου συμβαίνει το event: "none of us is awake" , "you don't know you’re awake" , "you know that I don't know you’re awake".

b Για κάθε ένα από τα παραπάνω events, γράψτε μία αντίστοιχη τροπική φόρμουλα με ατομικές προτάσεις (primitive propositions) I-awake , You-awake , και με τελεστές K_{Me} , K_{You} . Υπολογίστε το σύνολο όλων των καταστάσεων όπου αληθεύει κάθε φόρμουλα. Είναι το σύνολο που βρήκατε ίσο με το σύνολο όλων των καταστάσεων όπου συμβαίνει το αντίστοιχο event; Άν όχι, γιατί;

2 Εξετάστε το πρόβλημα *Coordination* - you are facing away from me , όταν
Prob { I'm awake } = M , Prob { you’re awake } = m .
Βρείτε περιοχές των M , m όπου οι παίκτες αποφασίζουν να παραμείνουν στο λεωφορείο. Υπάρχουν περιοχές των M , m όπου οι παίκτες αποφασίζουν να κατεβούν από το λεωφορείο;