

RChain

komunikacijska mreža budućnosti



Tomislav Grospić

RChain Meetup - 3.5.2018. Impact Hub, Zagreb





```
// Functor
interface FunctorAlg<F> {
    fun <a, b> map(f: (a) -> b): (App<F, a>) -> App<F, b>
}

// Apply : Functor
interface ApplyAlg<F> : FunctorAlg<F> {
    fun <a, b> apply(f: App<F, (a) -> b>): (App<F, a>) -> App<F, b>
}

// Applicative : Apply
interface ApplicativeAlg<F> : ApplyAlg<F> {
    fun <a> pure( x: a ): App<F, a>
}

// Bind : Apply
interface BindAlg<F> : ApplyAlg<F> {
    fun <a, b> bind( x: App<F, a> ): ((a) -> App<F, b>) -> App<F, b>
}
```

```
// Processes
private Proc4 ::= NIL | Value
private Proc3 ::= ChanRefSymbol Chan [ProcParen]
private Proc2 ::= Chan "!" ProcParen
private Proc1 ::= FOR BindParen ProcBlock
    | CONTRACT ContractName (" [CPattern] ")" "=" Proc
    | CONTRACT ContractName "=" TypeTerm // experimental
    | SELECT CBranchBlock
    | MatchWith
    | NEW [VarPattern] IN ProcBlock
    | NEW [VarPattern] IN Proc
    | LET ("(" CPattern ")") | CPattern "=" Proc IN Proc
    | ConstrName ProcParen
    | VAR ProcParen
    | "@" VAR
```

```
Document = __ nodes:Element* { nodes }
Element = RawText / Nested / Void / Comment / DocType / Text
RawText = Script / Style / Textarea / Title / PlainText
Script "script" = '<script'i attrs:Attributes ' >' -- content:(ch(!'</script'i
Style "style" = '<style'i attrs:Attributes ' >' -- content:(ch(!'</style'i
Textarea "textarea" = '<textarea'i attrs:Attributes ' >' -- content:(ch(!'</textarea'i
Title "title" = '<title'i attrs:Attributes ' >' -- content:(ch(!'</title'i
PlainText "plaintext" = '<plaintext'i attrs:Attributes ' >' -- content:(ch(!'</plaintext'i
Nested "element" = begin:TagBegin __ content:Element* end:TagEnd __ { begin.node == end
TagBegin "begin tag" = '<' name:Symbol attrs:Attributes ' >' { node name.toLowerCase!, attrs }
TagEnd "end tag" = '<' name:Symbol ' >' { name.toLowerCase! }
Void "element" = '<' name:Symbol attrs:Attributes ' / >' { node name, attrs }
Comment "comment" = '<!--' text:CommentText '-->' { node 'c' public static RacunOdgovor SendInvoice(RacunType invoice, X509Certificate2 certificate,
CommentText = ch(!'-->' c: { c }) * { ch.join ' ' } Action<FiskalizacijaService> setupService = null)
DocType "doctype" = '<!DOCTYPE'i __ root:Symbol __ type:( 'publ
node 'doctype' = ...
```

```
private static RacunOdgovor SendInvoice(RacunType invoice, X509Certificate2 certificate,
Action<FiskalizacijaService> setupService = null)
{
    if (invoice == null) throw new ArgumentNullException("invoice");
    if (certificate == null) throw new ArgumentNullException("certificate");

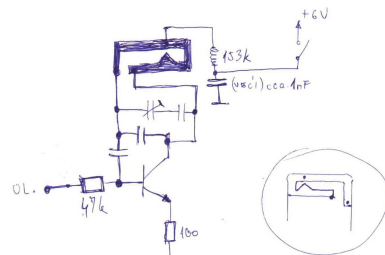
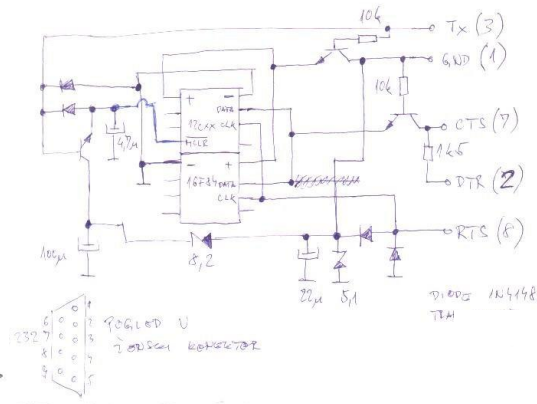
    var request = new RacunZahtjev
    {
        Racun = invoice,
        Zaglavlje = cis.Fiscalization.GetRequestHeader()
    };

    return SendInvoiceRequest(request, certificate, setupService);
}
```

```
pCodeLen :: Lazy (Parsers Number) => Parsers Number
pCodeLen = pCode >>= mkSubPLen
```

```
exprLen :: Lazy (Parsers Number) => Parsers Number
exprLen = pStrLen <|> (+) <$> pCodeLen <*> pStrLen
```

```
grammarLen :: Lazy (Parsers Number) => Parsers Number
grammarLen = foldl1 (+) 0.0 <$> many exprLen
```



PROBLEMI

IZAZOVI

PROBLEMI

- **Klimatske promjene**
- **Zaštita privatnih podataka**
- ▲ **Apsurdna ekonomska nejednakost**
- ◆ **Upotreba i razvoj novih tehnologija**

London's £10 T-charge comes into effect in fight against toxic car fumes

Drivers of older, more polluting petrol and diesel cars in centre of capital now liable for fee on top of congestion charge

Kevin Rawlinson

Mon 23 Oct 2017 11.04 BST



2,547

🕒 This article is over 6 months old



▲ Air pollution hangs over London. Legal pollution limits are regularly exceeded in the capital. Photograph: Nick Ansell/PA

OBJAVLJENI ALARMANTNI PODACI Evo kakav je zrak u Hrvatskoj

Piše B.V., 27. rujna. 2016. @ 18:08 [KOMENTARA](#)

3min.



Smog u Zagrebu (Foto: Arhiva/Robert Anic/Pixsell)

PM2.5 - max 10 $\mu\text{g}/\text{m}^3$
PM10 - max 20 $\mu\text{g}/\text{m}^3$

Zagreb

PM2.5 - 22 $\mu\text{g}/\text{m}^3$
PM10 - 36 $\mu\text{g}/\text{m}^3$

RIJEKA

PM2.5 - 11 $\mu\text{g}/\text{m}^3$
PM10 - 18 $\mu\text{g}/\text{m}^3$

„ Iako svijet već ima dovoljno problema svih vrsta, iz **Svjetske zdravstvene organizacije** upozoravaju na novi. Naime, onečišćenje zraka na globalnoj razini je u porastu i to predstavlja **ozbiljnu opasnost za globalno zdravlje ljudi.**

Klimatske promjene

- ★ U pitanju je opstanak civilizacije ← bitno!
- ★ Nismo sigurni hoćemo li uspjeti
- ★ Navukli smo se na naftu
- ★ Emisija CO² raste eksponencijalno
- ★ Posljedice su već sad vidljive



Aj'mo prestat' koristit'
enkripciju!

I pisat' ekčapoan!

Hi hi!

Ja mogu čuvat'
pečat!



PM's plans to monitor encrypted messages 'would turn UK into China'

**Encryption is mathematics, not technology -
it can't be suppressed by law**

Matthew Bloch, Bytemark

[Can the government ban encryption?](#)

Magazine points to 'lo
Cameron defends pro

Sviđa mi se ideja!

s David

Nama bi zgodno bilo da
smanjimo gravitaciju, što
kažeš?

Dečki pazite samo
na dragulje!

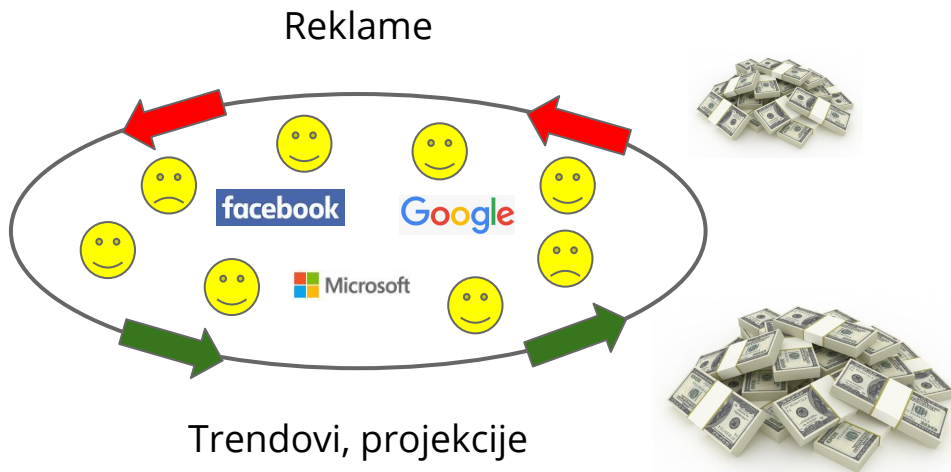


▲ David Cameron, with Barack Obama at the start of a two-day visit to Washington during which the prime minister spoke out about his surveillance proposals. Photograph: Pool/Getty Images



Zaštita privatnih podataka

- ★ Trgovanje osobnim podacima
- ★ FB je kupio WhatsApp za \$19 mlrd.
- ★ Želimo agregirane podatke (trendovi, alarmi, ...)
- ★ EU General Data Protection Regulation (GDPR)



Breakthrough device heals organs with a single touch

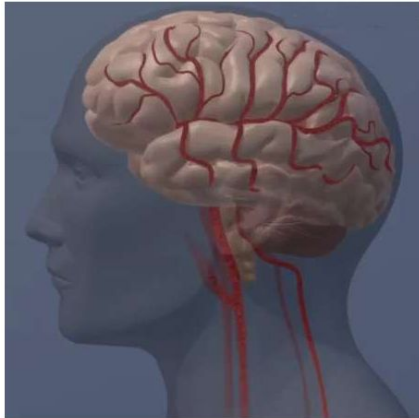
August 7, 2017, Ohio State University Medical Center



Researchers demonstrate a process known as tissue nanotransfection at The Ohio State University Wexner Medical Center. In laboratory tests, this process was able to heal the badly injured legs of mice in just three weeks with a single touch of this chip. The technology works by converting normal skin cells into vascular cells, which helped heal the wounds. Credit: The Ohio State University Wexner Medical Center.

Brain cells found to control aging

July 26, 2017, Albert Einstein College of Medicine



Credit: copyright American Heart Association

Scientists prove feasibility of 'printing' replacement tissue

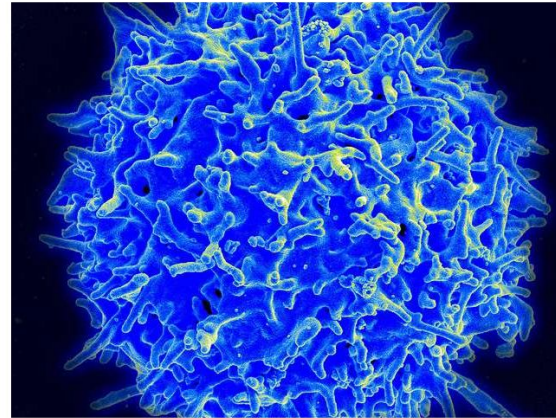
February 15, 2016, Wake Forest University Baptist Medical Center



The Integrated Tissue-Organ Printing System at work printing a jaw bone structure. Credit: Wake Forest Institute for Regenerative Medicine

Activation of immune T cells leads to behavioral changes

October 23, 2017, RIKEN

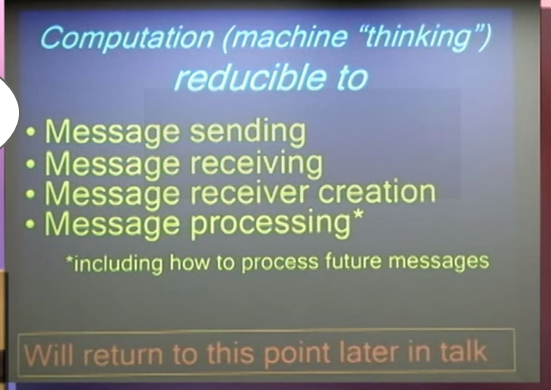


Scanning electron micrograph of a human T lymphocyte (also called a T cell) from the immune system of a healthy donor. Credit: NIAID

Nove tehnologije i istraživanja

- ★ Profit u proizvodnji hrane i lijekova
 - veća koncentracija kao novi lijek
 - antibiotici u uzgoju mesa (EU €1.3 mlrd. za prevenciju)
- ★ Patentiranje softvera je preskupo i prekomplikirano
- ★ Raj za odvjetnike

Actor model!
Ha ha ha

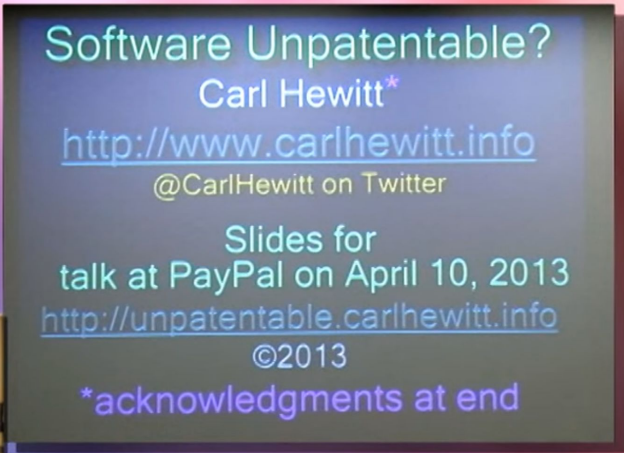


*Computation (machine "thinking")
reducible to*

- Message sending
- Message receiving
- Message receiver creation
- Message processing*

*including how to process future messages

Will return to this point later in talk



Software Unpatentable?
Carl Hewitt*

<http://www.carlhewitt.info>
@CarlHewitt on Twitter

Slides for
talk at PayPal on April 10, 2013
<http://unpatentable.carlhewitt.info>
©2013
*acknowledgments at end

The Next Radical Internet Transformation: How Blockchain Technology is Transforming Business, Governments, Computing, and Security Models

Mark Mueller-Eberstein

Association for Computing Machinery (ACM)

"The Next Radical Internet Transformation: Blockchain Technology," with Mark Mueller-Eberstein

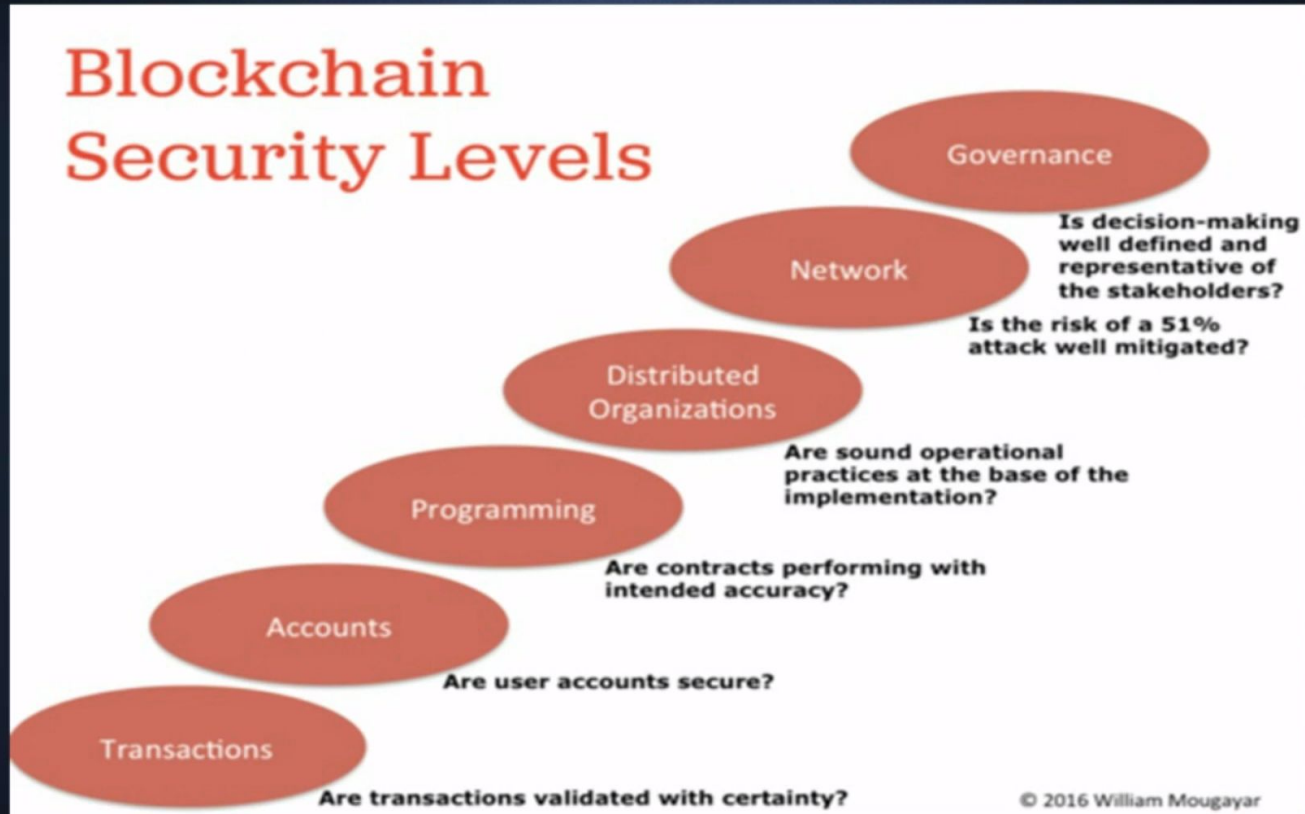
At least \$1.7 trillion in "inefficiencies"
up for grabs...



Blockchain security

Mark Mueller-Eberstein

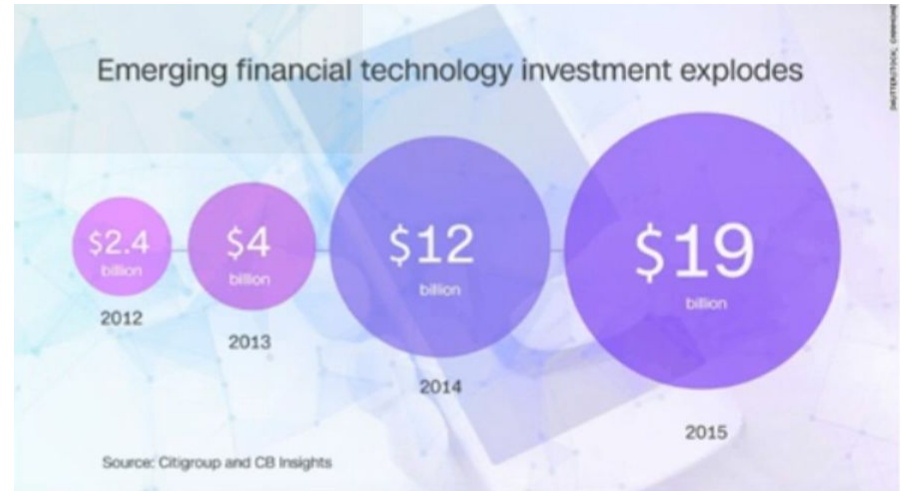
Association for Computing Machinery (ACM)



Kapital

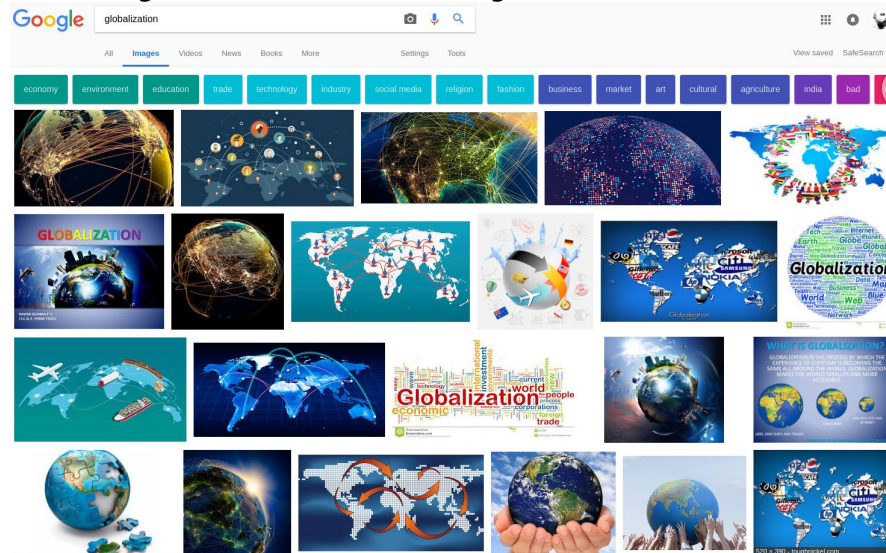
- ★ Kreiranje i transfer kapitala su preskupi i prespori
- ★ Centraliziran u bankama
- ★ Međudržavno slabo reguliran
- ★ EU: SEPA, TIPS, WTR2, PSD2 - instant plaćanje, P2P plaćanje
- ★ FinTech ulaganja 5 g. *10 sljedećih 5 g. \$150mlrd.
- ★ API: Danish Saxo Bank, Capital One

“Banking is necessary;
banks are not
(Bill Gates, 1990)”



Globalizacija ≠ Centralizacija

- ★ Globalizacija omogućava distribuiranu organizaciju
- ★ Važna je komunikacija između pojedinca i kolektiva
- ★ Lokalno djelovanje za globalni cilj
- ★ Dijeljenje znanja i informacija

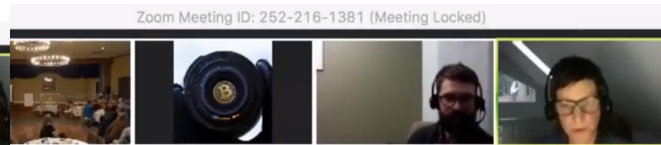
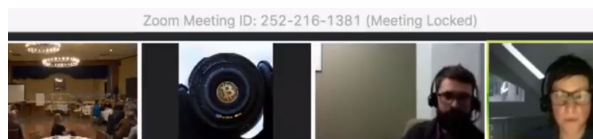
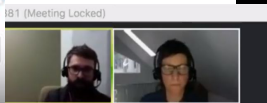
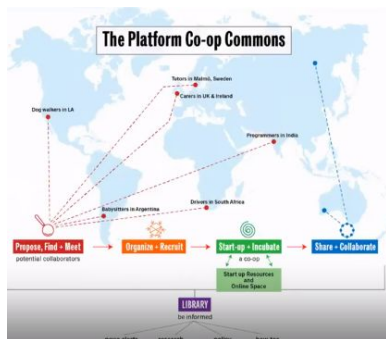


RChain Governance Conference, Seattle, Feb 2018.

★ Designing Platforms for Cooperative Economic Inclusion

★ Open source platforma za udruge

Dana Ayotte and Colin Clark
Inclusive Design Research Centre
OCAD University, Toronto



The Digital Economy

We can build on a powerful business model that works.

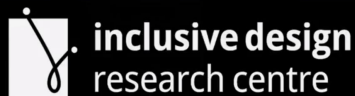


- 1 in 3 Americans is a co-op member.
- In the U.S., co-ops created close to 1 million jobs with \$25 billion in wages and benefits.
- The total co-op revenue in the U.S. is \$500 billion.
- Cooperative enterprises worldwide employ 250 million people and generate \$2.2 trillion in revenue.
- Co-ops are hidden in plain sight!

Benefits of the Platform Co-op Model



- ✓ Lower transaction and retention costs
- ✓ Surplus revenues transferred to members
- ✓ 80% of co-ops survive their first 5 years compared with 41% of other business ownership models
- ✓ Money flows within local communities
- ✓ Protection from exploitation through ownership, transparency, worker control
- ✓ Higher commitment of users reduces short-termism
- ✓ Prospect of data democracy

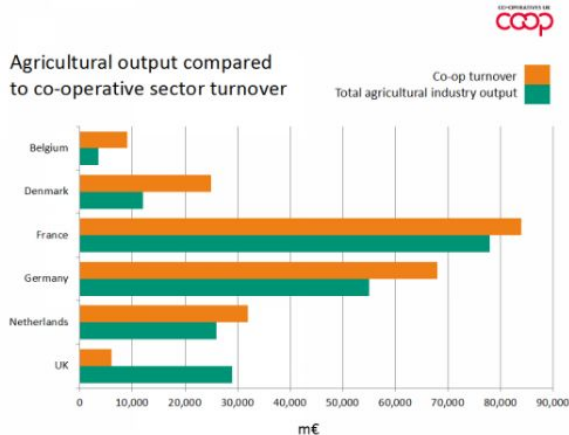


**inclusive design
research centre**

- grow design and development practices
- create tools that others can use and contribute to
- teach the principles and techniques of inclusive design
- advocate for inclusion in international standards
- provide services that match solutions with individuals

Udruga, Co-op

- ★ Worker co-operatives are **larger than conventional businesses** and not necessarily less capital intensive
- ★ Worker co-operatives survive at least as long as other businesses and have **more stable employment**
- ★ Worker cooperatives are **more productive** than conventional businesses, with staff **working “better and smarter”** and **production organised more efficiently**
- ★ Worker co-operatives **retain a larger share of their profits** than other business models
- ★ Executive and non-executive pay differentials are much narrower in worker co-operatives than other firms



[What do we really know about worker co-operatives?](#)

Virginie Pérotin, Professor of Economics
Leeds University Business School

Ova ultra-moderna medicinska ustanova dio je **Bolnice Barcelona (Hospital Barcelona)** u **Španjolskoj**, kojom demokratski upravljaju udruge. Udruga Scias, integrirana u Zakladu Espriu, upravlja Bolnicom Barcelona preko savjetodavnog odbora kojega čini 15 članova. Od njih 15, 12 ih zastupa **166.000 članova korisnika**, a troje zastupa **800 članova radnika**.





Mondragon Corporation je korporacija i federacija radničkih udruga sa sjedištem u baskijskoj regiji Španjolske. Osnovani su je **1956.** g. u gradu Mondragon diplomanti lokalnog tehničkog sveučilišta.

Tip: **Worker cooperative federation**
 Zaposlenih: **74.335 (2015)**
 Prihodi: **€ 12.110 mlrd. (2015)**
 Imovina: **€ 24.725 mlrd. (2014)**
 Sektori: **Financije, industrija, maloprodaja, edukacija/inovacije**



Rholang, RChain

- ★ **ourChain**
- ★ **ρ -calculus** (rho)
- ★ **r**-eflective*, **h**-igher **o**-rder process language

$$\begin{array}{l} \mathbf{P} ::= \mathbf{0} \\ \quad | \text{for } (\mathbf{y} \leftarrow \mathbf{x}) \mathbf{P} \\ \quad | \mathbf{x}!\mathbf{P} \\ \quad | \mathbf{P} \mid \mathbf{P}' \\ \quad | * \mathbf{x} \end{array}$$
$$\mathbf{x}, \mathbf{y} ::= @\mathbf{P}$$

* programi pišu programe

Rholang, RChain

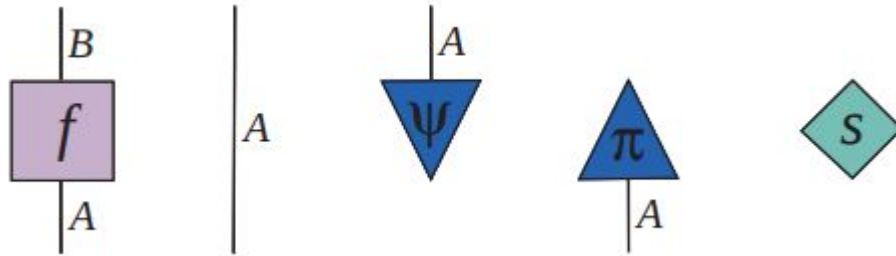
- ★ **ourChain**
- ★ **ρ -calculus (rho)**
- ★ **r-eflective*, h-igher o-rder process language**

$$\begin{array}{l} \mathbf{P} ::= \mathbf{0} \\ \quad | \text{for } (\mathbf{y} \leftarrow \mathbf{x}) \mathbf{P} \\ \quad | \mathbf{x}!\mathbf{P} \\ \quad | \mathbf{P} | \mathbf{P}' \\ \quad | * \mathbf{x} \end{array}$$
$$\mathbf{x}, \mathbf{y} ::= @\mathbf{P}$$

* programeri koriste
programme za pisanje programa

Prosesi kao dijagrami

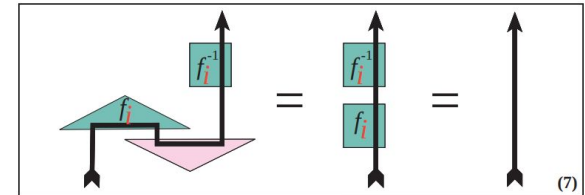
LOGIC & PROOF THEORY	PROGRAMMING	(OPERATIONAL) PHYSICS
Propositions	Data Types	Physical System
Proofs	Programs	Physical Operation



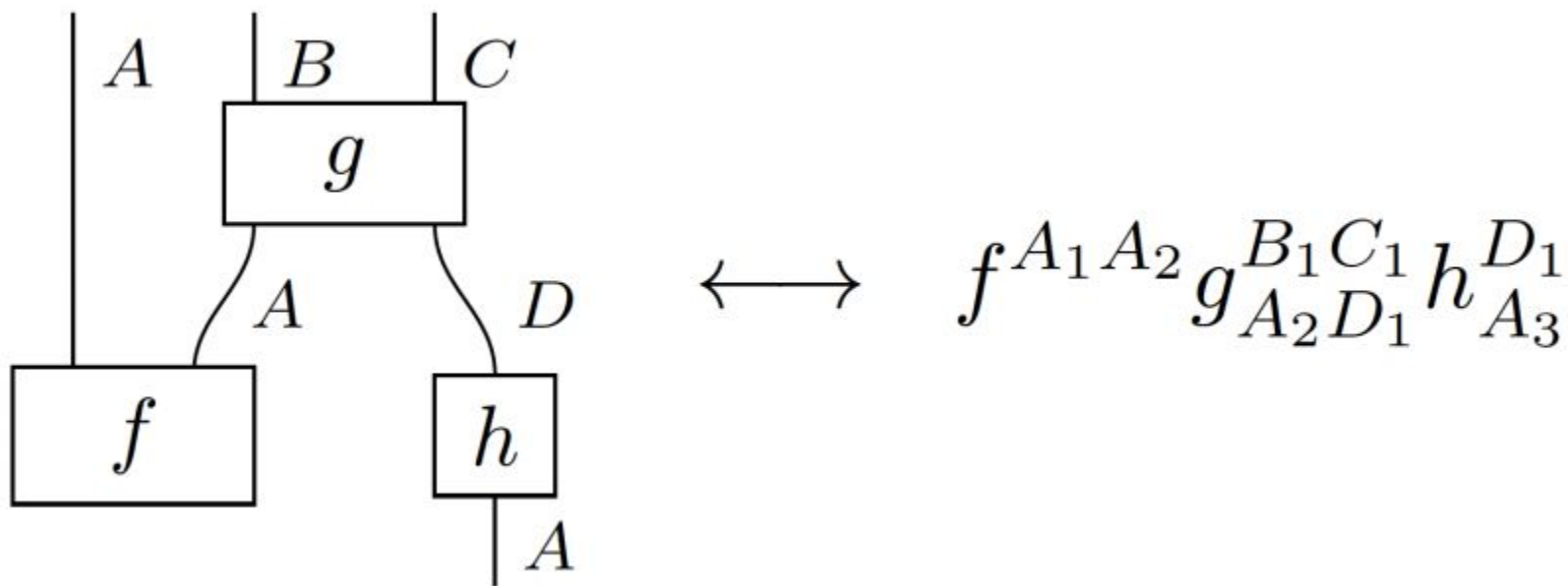
Kindergarten Quantum Mechanics

Bob Coecke

Oxford University Computing Laboratory,
Wolfson Building



Prosesi kao dijagrami



Type system & LADL algoritam

- ★ Logic As a Distributive Law - “Game changer”
- ★ Spatial-behavioral type system
- ★ Može detektirati DAO bug (race condition)

HRChain TODO

- ★ Registrirati udrugu u Hrvatskoj
- ★ Povezati se s RChain co-op Berlin i Seattle
- ★ Ostvariti komunikaciju u cilju razvoja novih aplikacija
- ★ Popularizirati upotrebu Blockchain tehnologija
- ★ Novosti o RChain platformi

HVALA NA PAŽNJI