Further HCI

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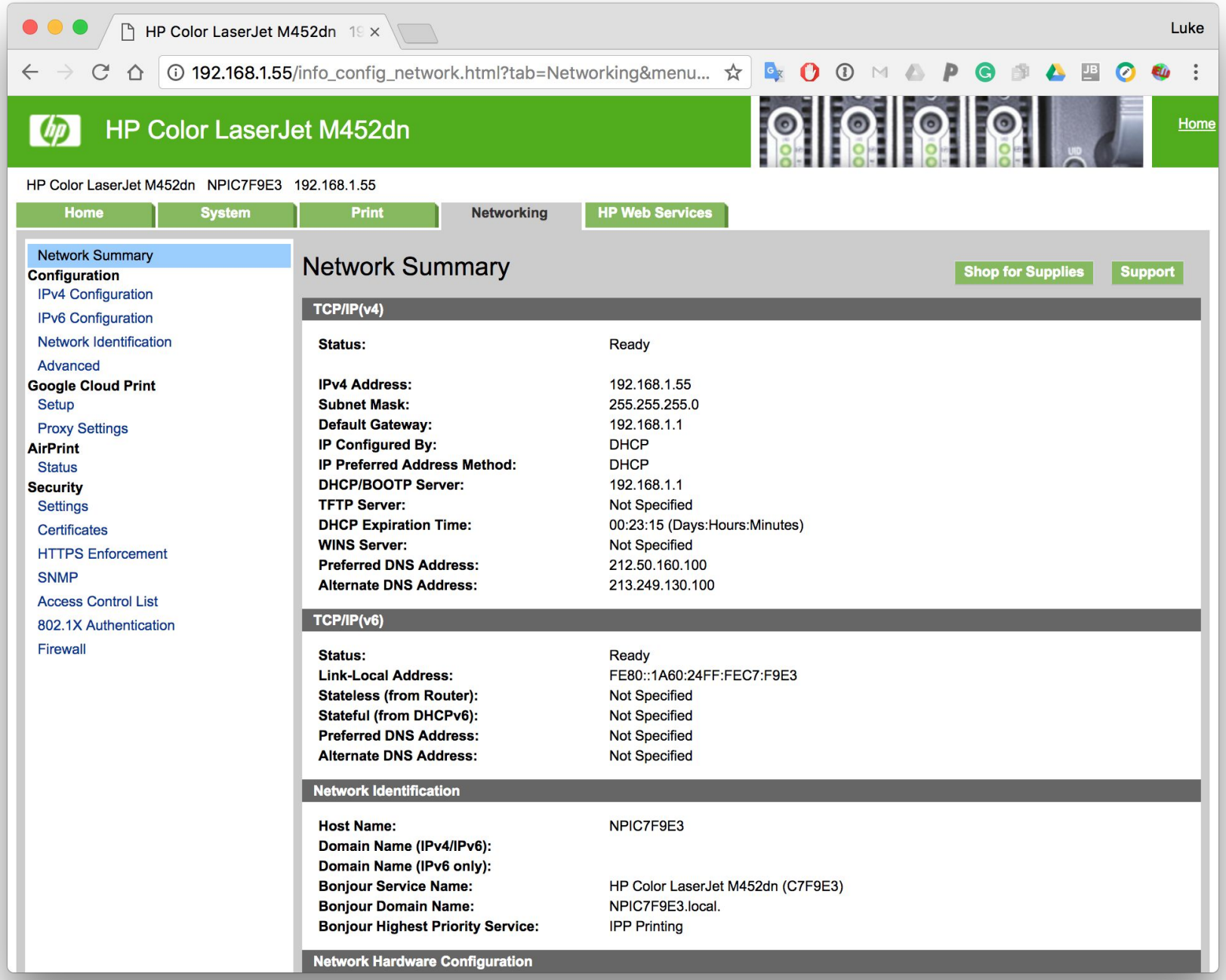
Overview of the course

- **Theory driven approaches to HCI**
- Design of visual displays
- Goal-oriented interaction
- Designing efficient systems
- Designing smart systems
- Designing meaningful systems (guest lecturer)
- Evaluating interactive system designs
- Designing complex systems as interaction spaces

Lecture 1:
Theory driven approaches to HCI

What is a theory in HCI? Why take a theory driven approach to HCI?

Why theory in HCI?



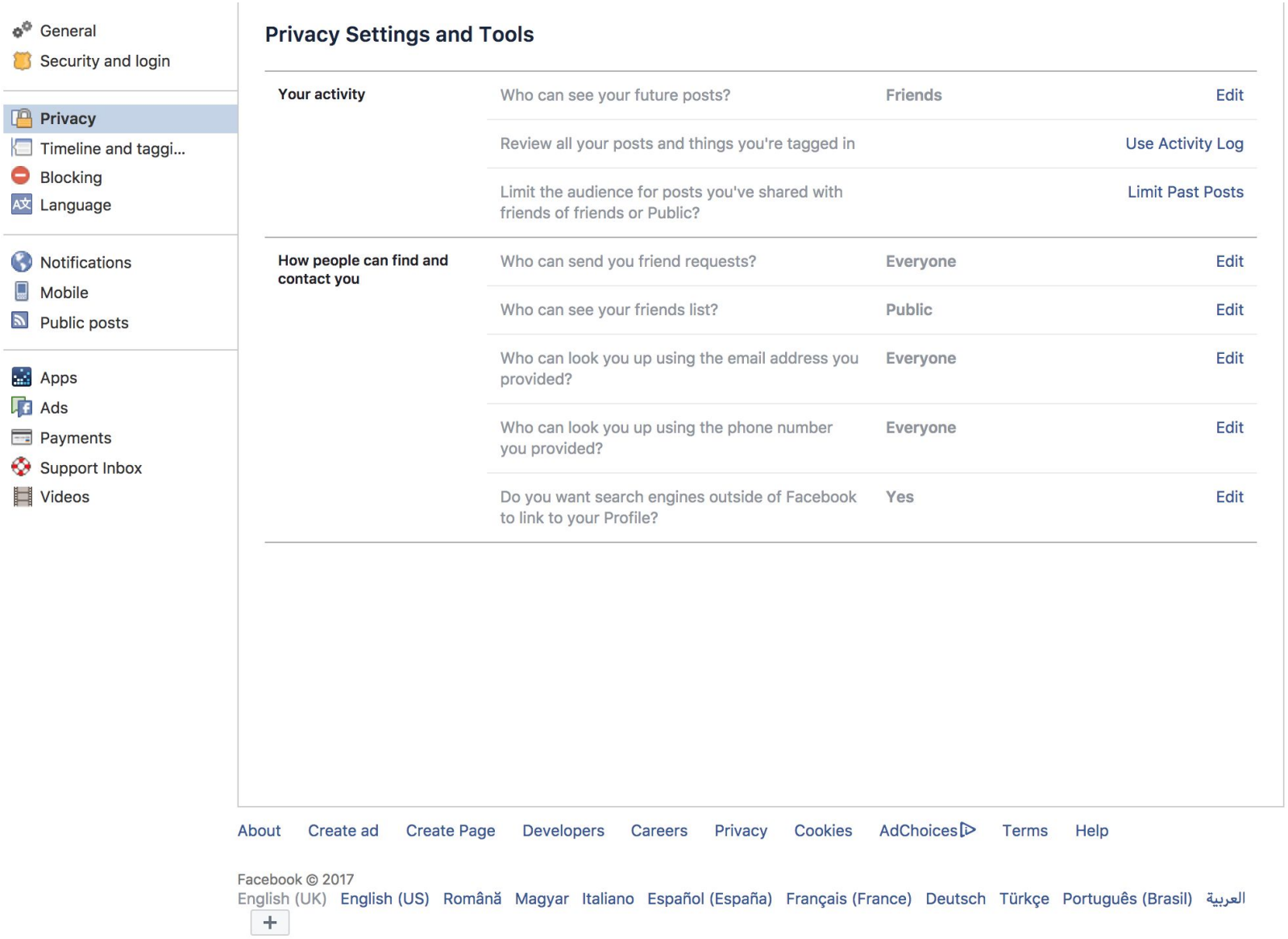
Installing a family printer in 2017

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?



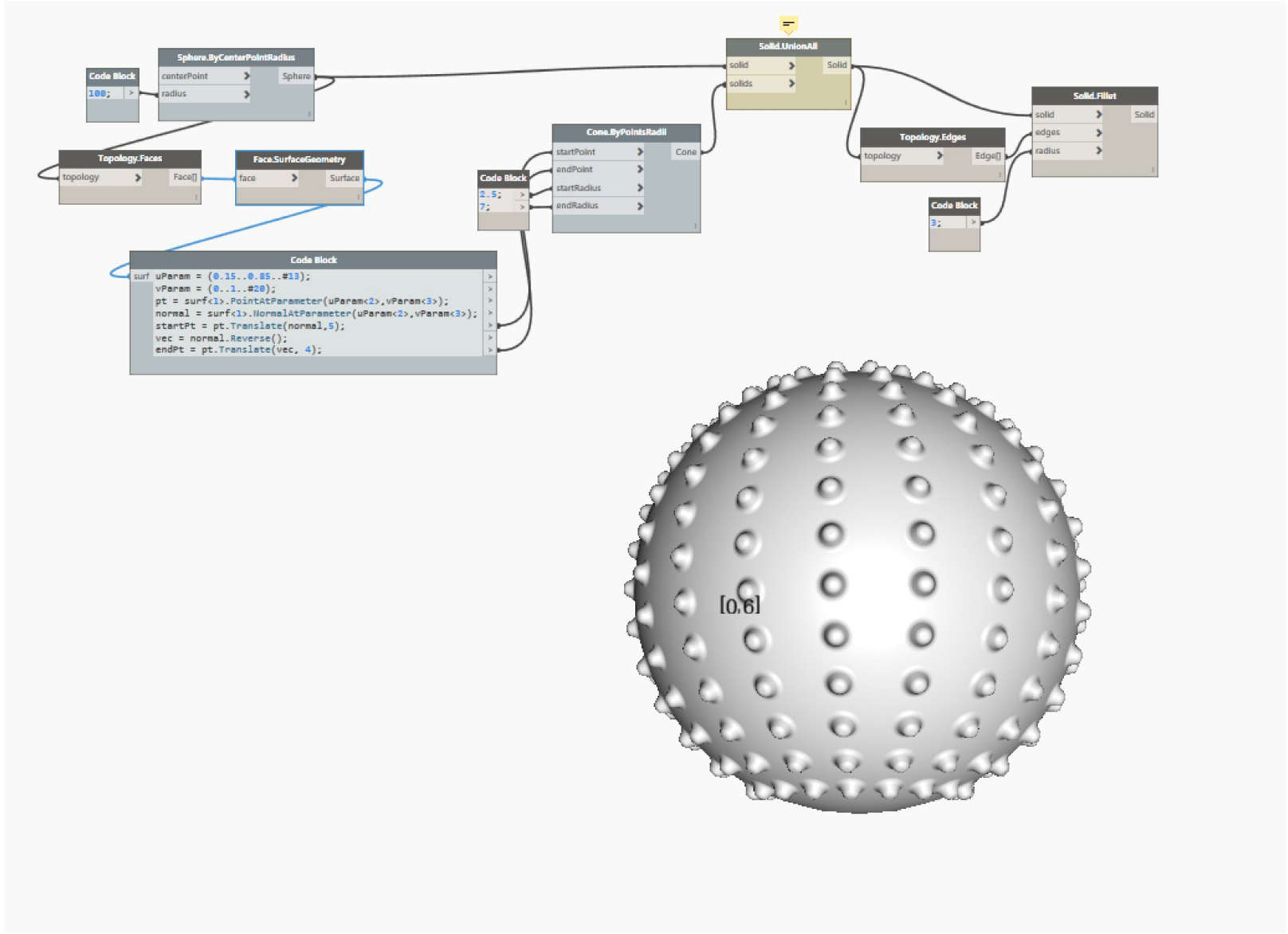
Facebook privacy in 2017

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?



Visual Programming in 2017

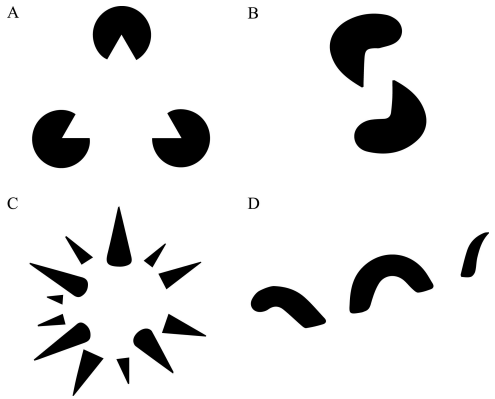
How would you design this?

Is this a good programming language?

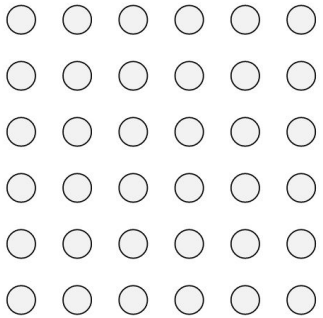
Derived from: http://dynamoprimer.com/en/05_Geometry-for-Computational-Design/5-6_solids.html

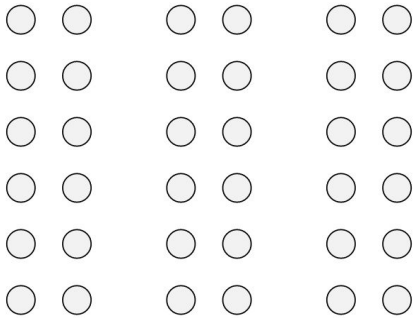
Theories give a *critical perspective*

Reminder of a theory:
Gestalt theory of perceptual organisation

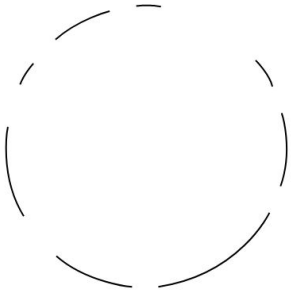


Continuity





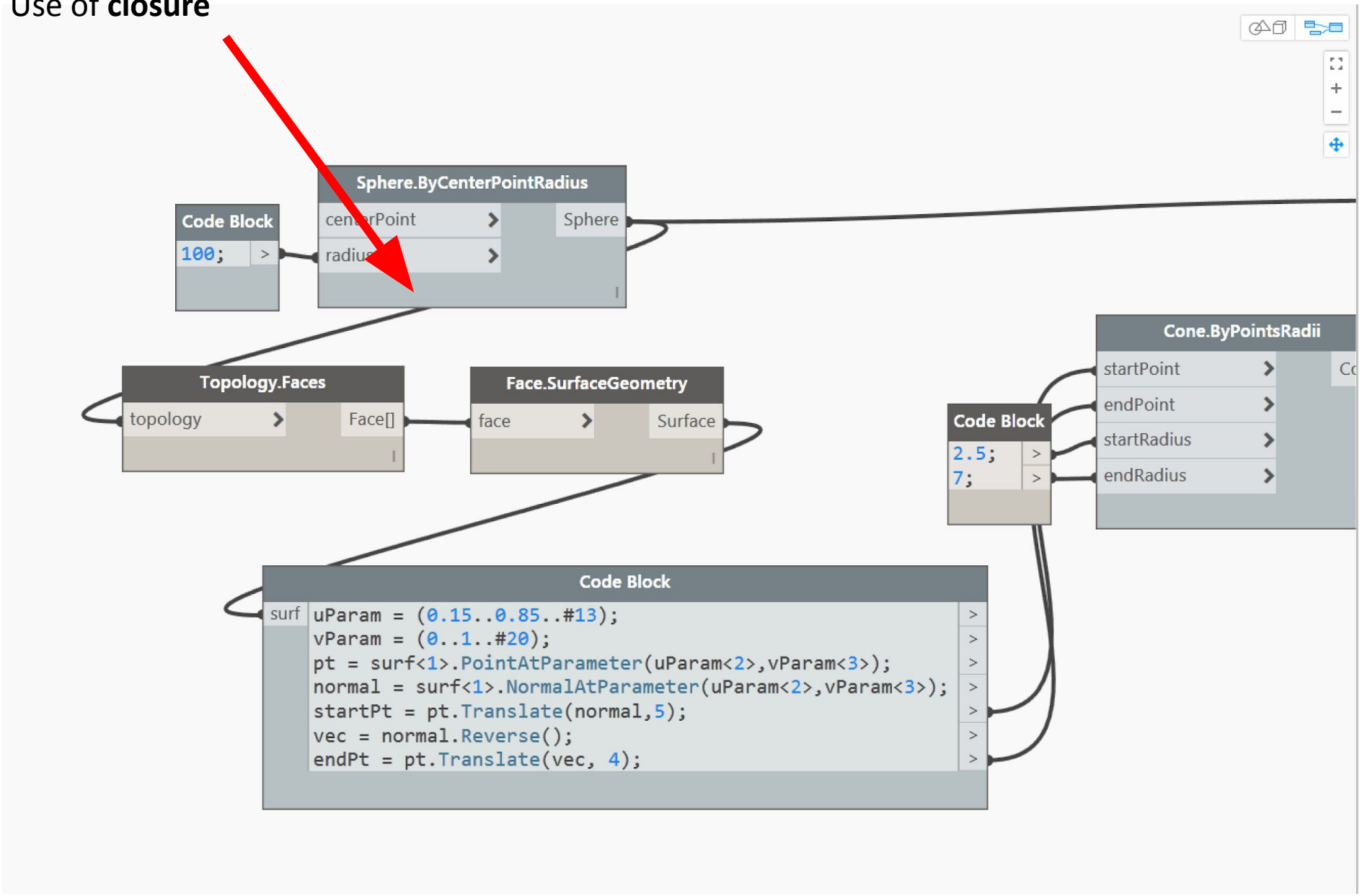
Similarity



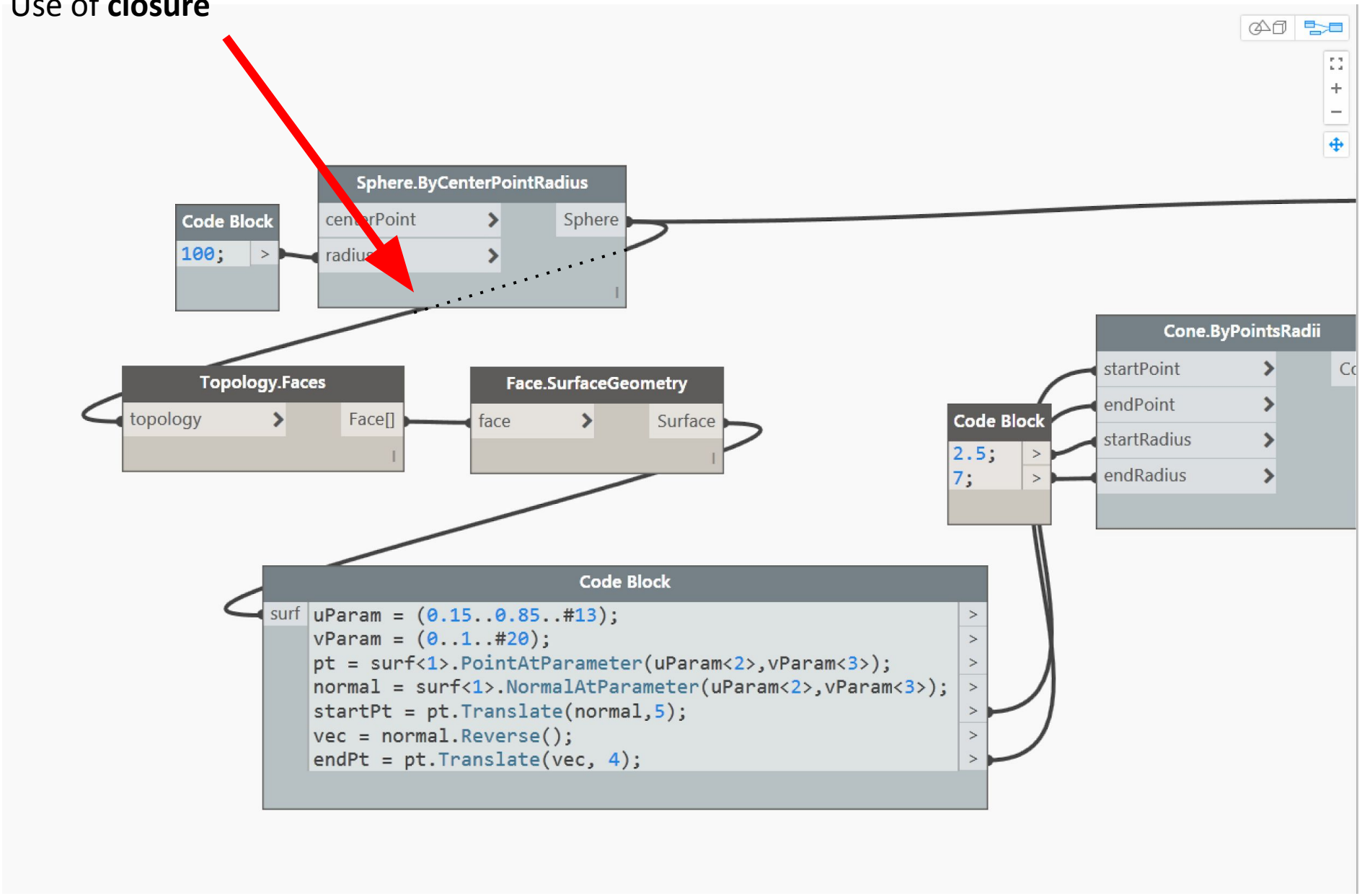
Closure

Images from: https://en.wikipedia.org/wiki/Gestalt_psychology

Use of **closure**

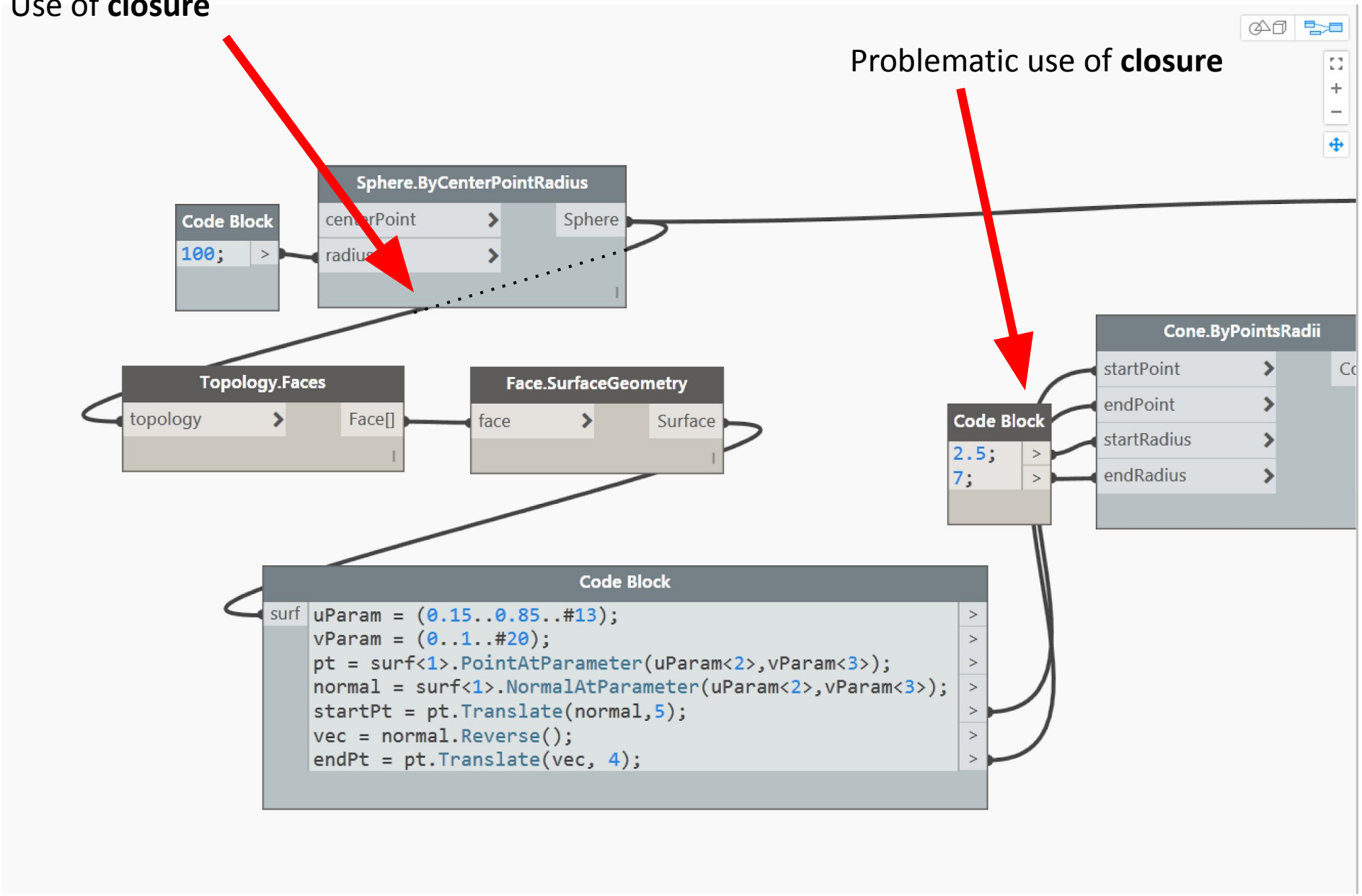


Use of **closure**

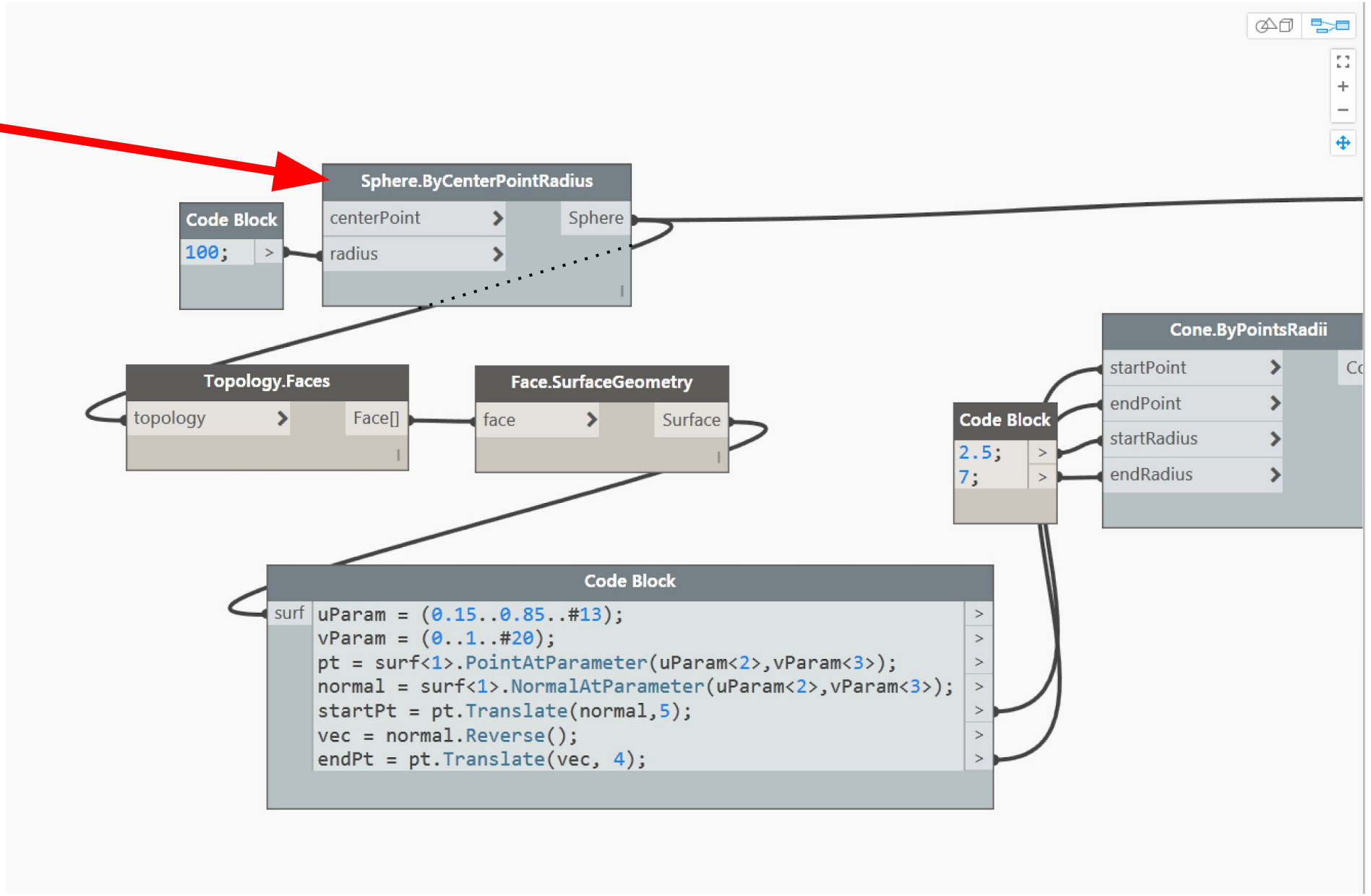


Use of **closure**

Problematic use of **closure**

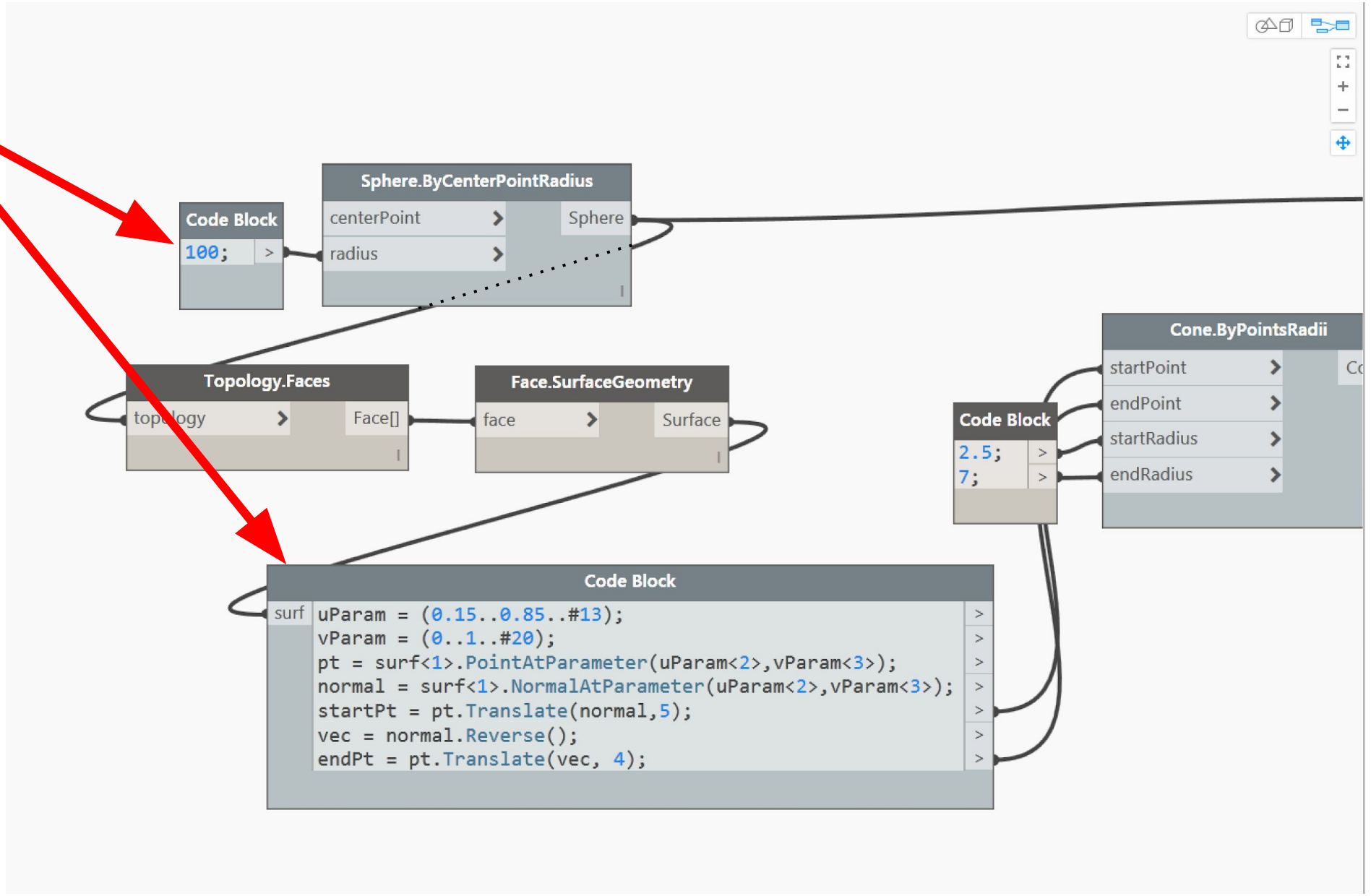


No use of **continuity**



Problematic
Similarity

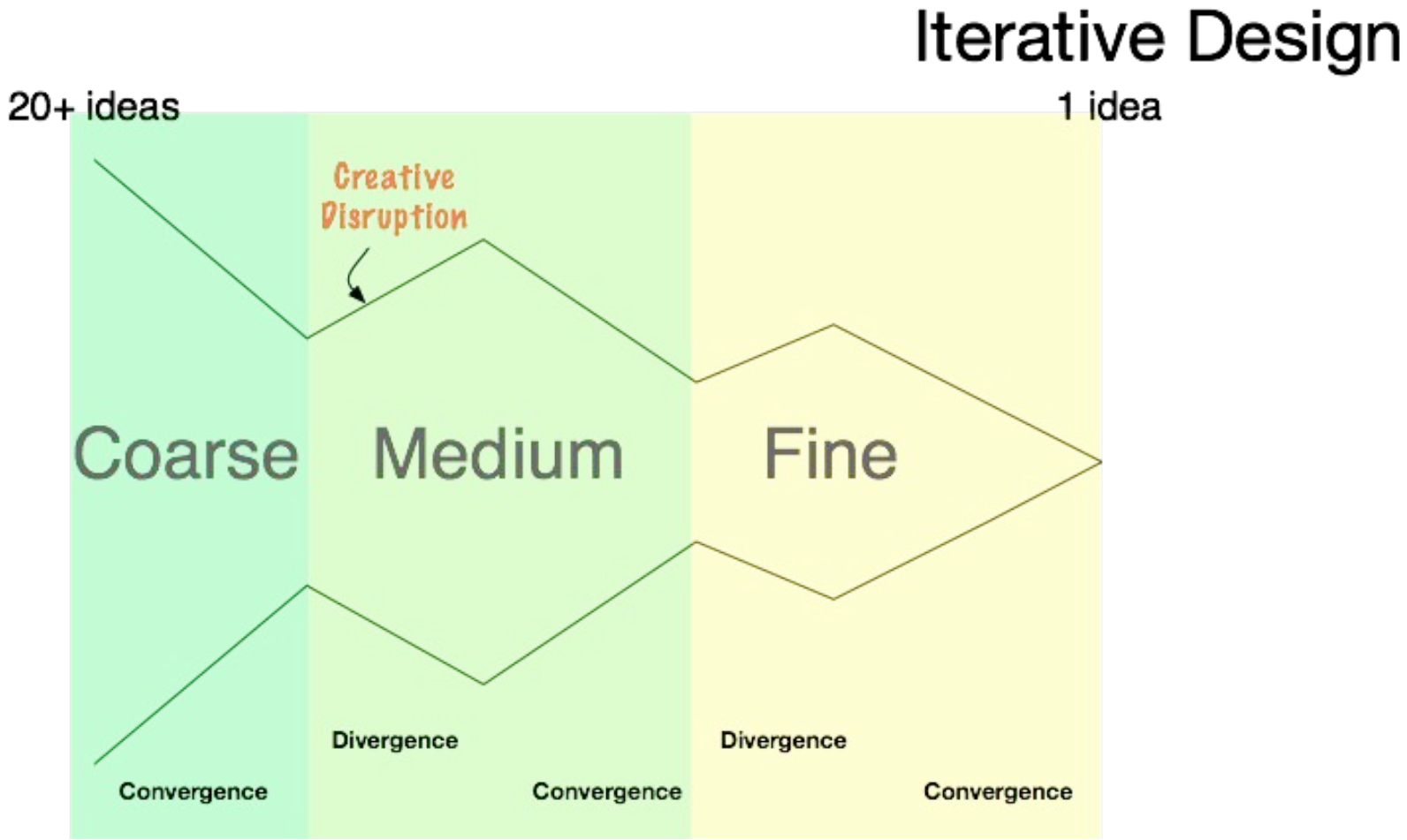
Do users think these are the same?



Summary of gestalt theory application

- Took a candidate design (Dynamo UI)
  - Predicted some properties that probably work well
  - Predicted some properties that might cause problems
- Over the course of the lectures you'll see many theories like this
- How do we make use of critique?

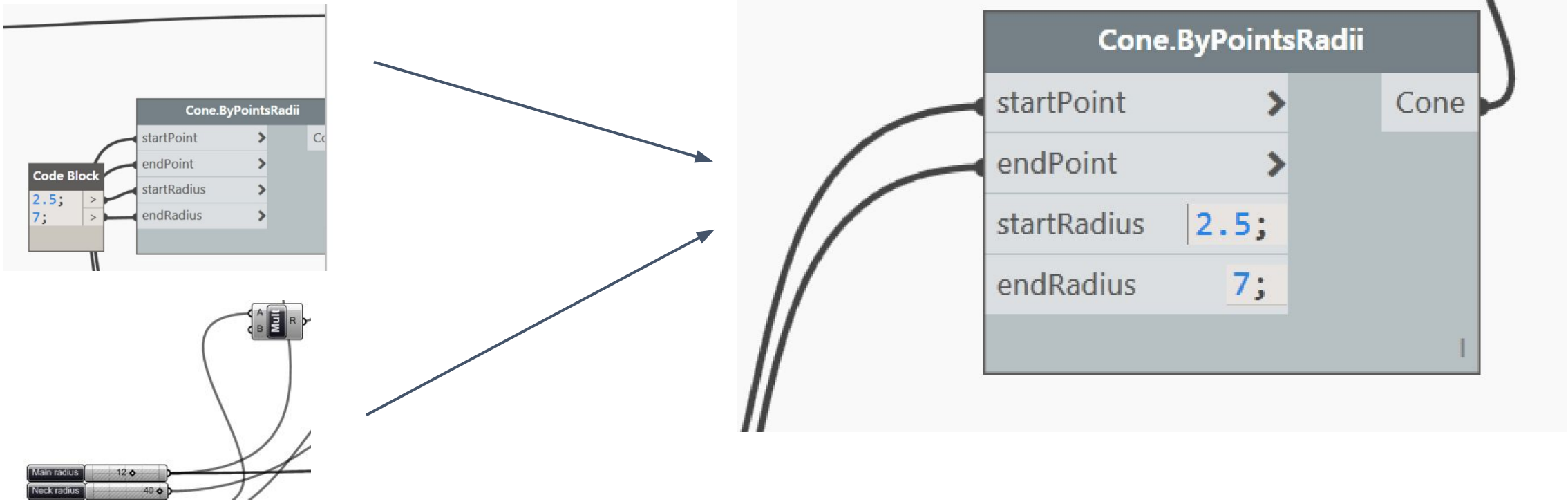
Critique your way to a design



Derived from Pugh '56

Example of convergence

- Merge features from two candidate designs to produce a better one
- Discard ideas that poorly fit the desired outcome

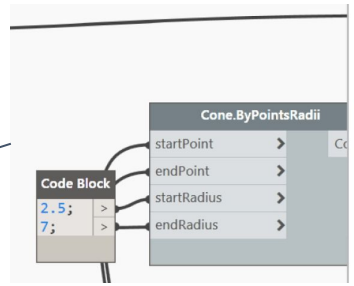


Grasshopper image: http://www.rhino3dhelp.com/wp-content/uploads/2010/02/jk-0x0.png

Example of divergence

- Generate new designs from existing one
- Use any creative technique, e.g. ‘gestalt swapping’, ‘reduction to absurdity’ or exploring metaphors

(e.g. what happens if we replace connectedness with similarity)



2.5

7

Cone.ByPointsRadii

startRadius

endRadius

Cone.ByPointsRadii

startRadius( )

endRadius ( )

=2.5

=2.5

(Variables as emoji from Seymour, Kasibatla and Warth, 2017)

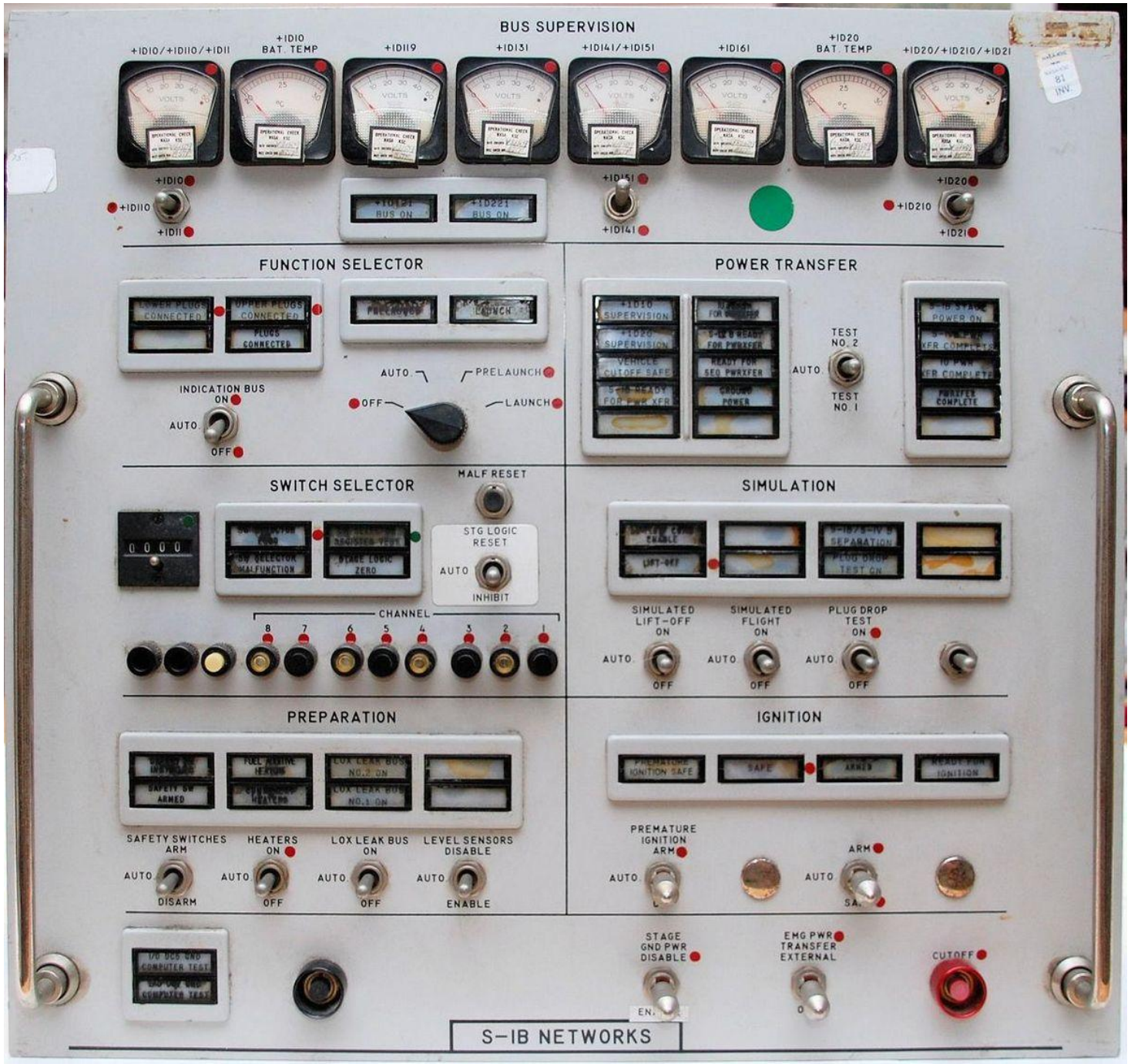
Why theory in HCI?

- We’ve interested in making interaction with computers faster, more productive, more creative, more social, more fun, somehow ‘better’.

- Theories give us ways of criticising proposed designs and toolkits for inventing new ones

Three waves of HCI

- First wave (1980s):
  - Theory from Human Factors, Ergonomics and Cognitive Science
- Second wave (1990s):
  - Theory from Anthropology, Sociology and Work Psychology
- Third wave (2000s):
  - Theory from Art, Philosophy and Design



Apollo-Soyuz controls 1975

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?

Photo: Jonathan H. Ward 2009

First wave: HCI as engineering "human factors"

- The "user interface" (or MMI "man-machine interface") is a specialist module, designed independently of the main system.
- Design goal is efficiency (speed and accuracy) for a human operator to achieve well-defined functions.
- Use methods from cognitive science and ergonomics to model users' perception, decision and action processes and predict usability.

An information system

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?

Photo: ZeeNews India, 2017

Second wave: HCI as social system

- The design of complex systems is a socio-technical experiment
  - Take account of other information factors including conversations, paper, and physical settings
- Study the context where people work
  - Use Ethnography and Contextual Inquiry to understand other ways of seeing the world
- Other stakeholders are integrated into the design process
  - Prototyping and participatory workshops aim to empower users and acknowledge other value systems

Blood bag radio

How would you design this?

Is this a good UI?

How do we know?

Could we improve it?

Photo: Dunne & Raby, 2009

Third wave: HCI as culture and experience

- Ubiquitous computing affects every part of our lives
  - It mixes public (offices, lectures) and private (bedrooms, bathrooms)
- Outside the workplace, efficiency is not a priority
  - Usage is discretionary
  - User Experience (UX), includes aesthetics, affect,
- Design experiments are speculative and interpretive
  - Critical assessment of how this is meaningful

Specialist topics not covered here:

- Graphics and VR - elsewhere in CS Tripos
- Digital media studies - Cambridge Digital Humanities
- Game design - Anglia Ruskin University
- Social network analysis - elsewhere in CS Tripos
- Computer music - elsewhere in CS Tripos, Centre for Music & Science
- Security - elsewhere in CS Tripos
- Educational technology - Faculty of Education
- Information Systems - Judge Business School

Alternative perspectives

- Positive computing (e.g. Calvo & Peters 2014)
  - Wellbeing, flow, empathy, mindfulness, altruism
- Inclusion and accessibility (e.g. CWUAAT #1-9)
  - physical and sensory capabilities, ageing, low income and human rights
- Feminist utopianism (e.g. Bardzell 2010)
  - Diagnostic critique of hegemonic research and practice, combined with practice-led participatory processes of anticipation that amplify marginalized voices

Supervisions

- 2 supervisions after lecture 4 and lecture 8, recommend completing all the lectures before the last supervision

Textbooks

- Preece, Sharp & Rogers *Interaction Design: Beyond human-computer interaction* - (5th edition 2019)
  - Practical professional advice, with good summaries of relevant theories and research methods
  - Any edition is useful, and there are many copies in Cambridge libraries
- Carroll (Ed.) *HCI Models, Theories and Frameworks: Toward a multidisciplinary science* 2003
  - Expert introductions to the different theoretical traditions of the first and second waves (noting that the third wave is more practice-based, beyond purely academic theory)

Toward original research

We look at user interfaces and software systems through the lens of programming languages. We think this approach illuminates a lot of the important properties of the system.

This is an advanced perspective, but especially relevant to Cambridge students, and to future innovation (the GUI was originally a programming language!)

See Alan's new book *Moral Codes: Designing software without surrender to AI* for an extended version of this argument: https://moralcodes.pubpub.org

For now, we'd love you to give us examples of systems you'd like to talk with us about during the course.

Which systems shall we talk about?

- The UI of a game
- ex-Twitter
- Moodle
- Note taking applications
- Windows
- ChatGPT
- Debugger / Notional machine