

Opening the Black Box of Interaction in Visualization

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VIS Tutorial 2014



TECHNISCHE
UNIVERSITÄT
DARMSTADT



1. Fraunhofer IGD, Rostock, Germany
2. TU Darmstadt, Darmstadt, Germany
3. Dominikus Baur Interfacery

INTRODUCTION

About the Speakers:

Hans-Jörg Schulz



- PhD in 2010 @ University of Rostock
- Thesis on Graph Visualization
- Currently Senior Researcher @ Competence Center Interactive Document Engineering, Fraunhofer Inst. for Computer Graphics Research, Rostock
- Fields of Research:
 - Design Spaces
 - Vis. of Heterogeneous Data
 - Vis. for the Life Sciences
 - Graph & Tree Visualization

About the Speakers: Tatiana von Landesberger



- PhD in 2010 @ TU Darmstadt
- Thesis on Visual Analytics of graphs and time-dependent data
- Now head of the Visual Analysis and Search Group @ TU Darmstadt
- Fields of Research:
 - Visual analysis of graphs
 - Visual analysis of time-dependent data
 - Visual cluster analysis
 - Application areas: finance, biology and meteorology

About the Speakers:

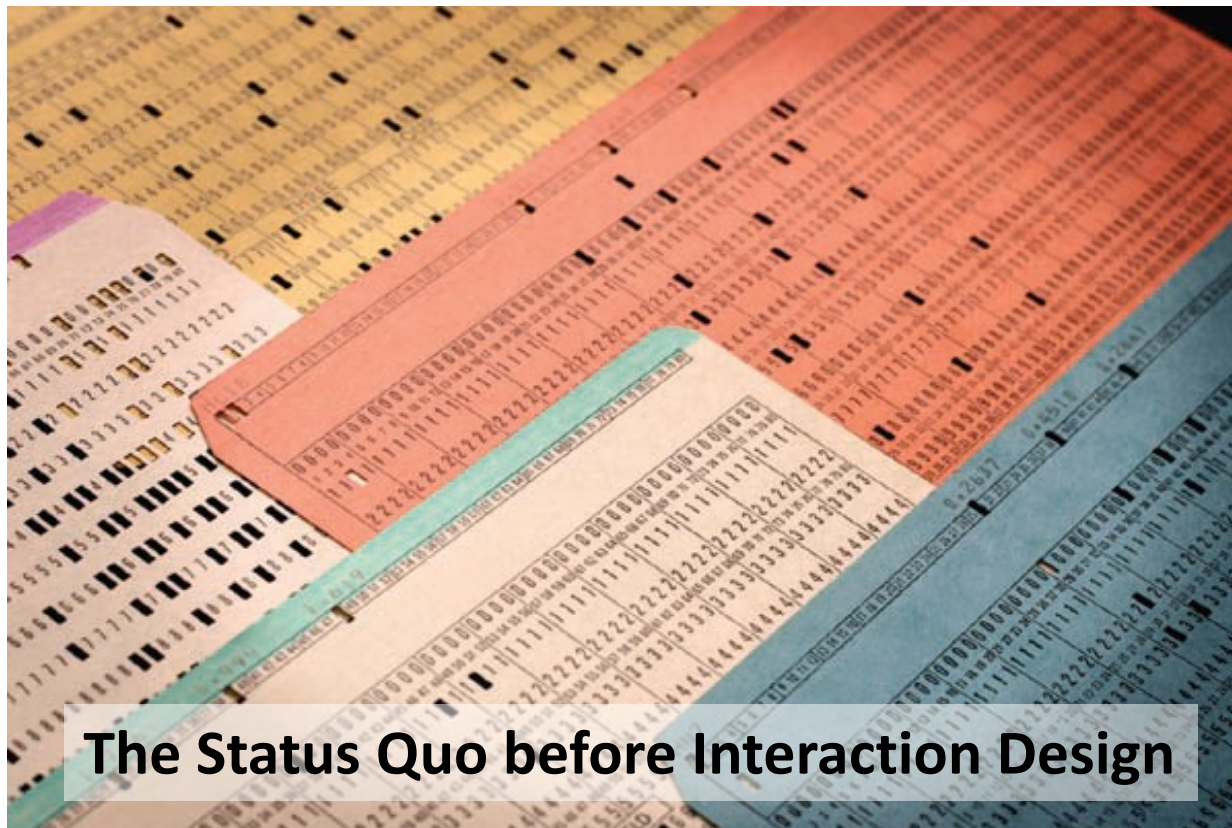
Dominikus Baur



- PhD in 2011 @ LMU Munich
- Thesis on Visualizing music listening histories
- Now independent researcher
- Fields of Research:
 - Data Visualization
 - Mobile Interaction Design
 - ...

About the Tutorial Topic

The History of Human-Computer-Interaction

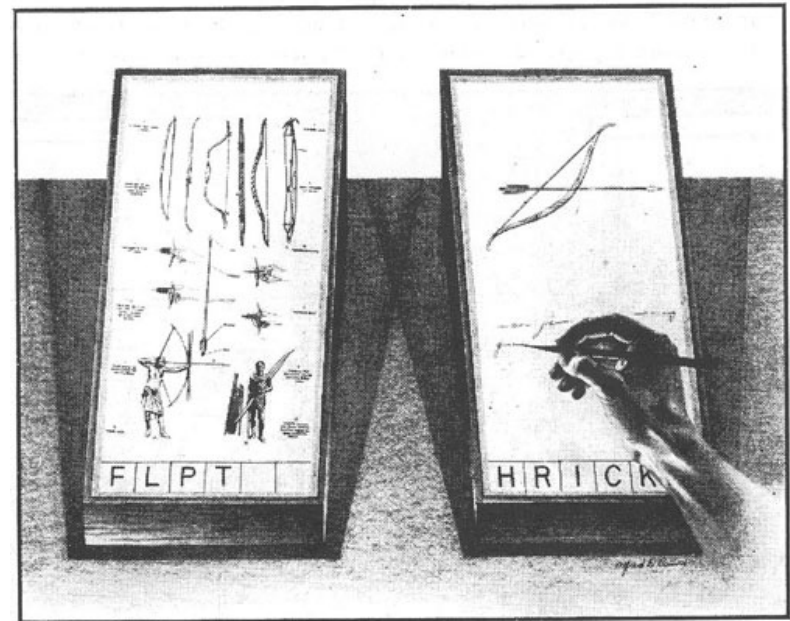


The Status Quo before Interaction Design

Image taken from Saffer (2010)

About the Tutorial Topic

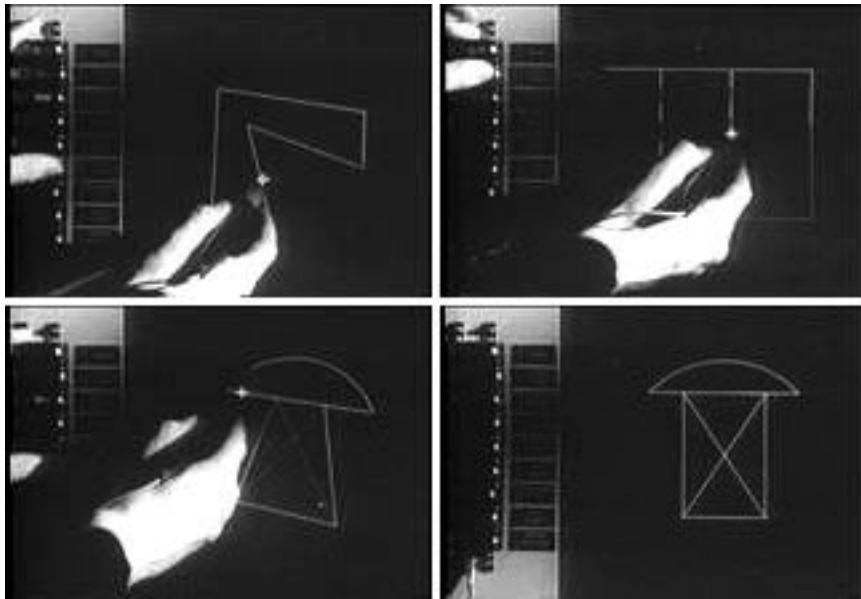
The History of Human-Computer-Interaction



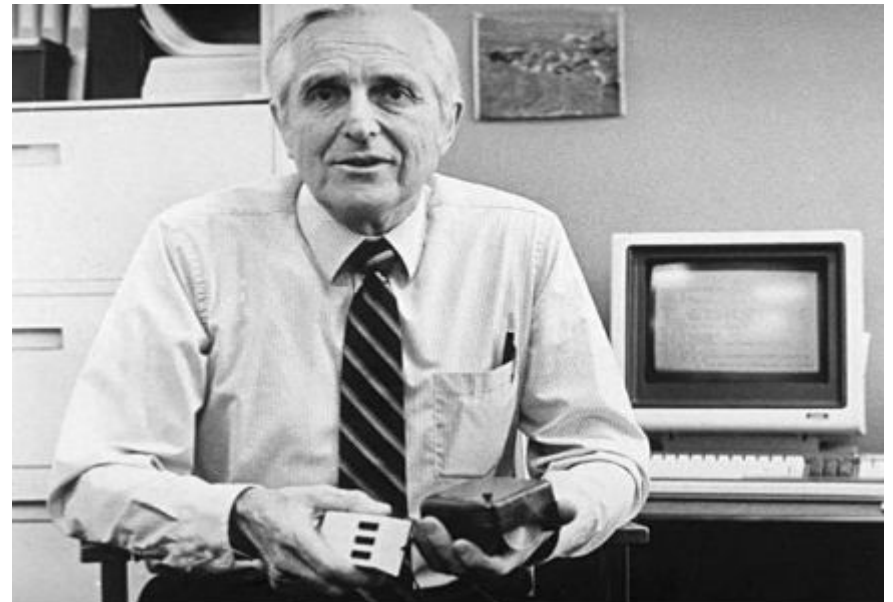
1945 – Vannevar Bush: Article in Atlantic Monthly on “Memex” (written in 1936!)

About the Tutorial Topic

The History of Human-Computer-Interaction



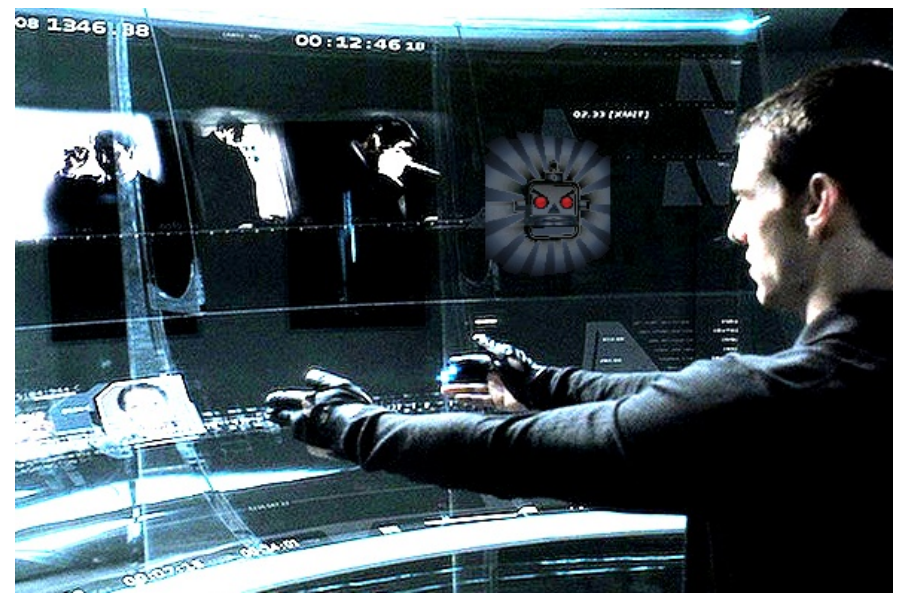
1963 – Ivan Sutherland: Sketchpad



1968 – Doug Engelbart: First presentation of the mouse (among other things)

About the Tutorial Topic

The History of Human-Computer-Interaction



2002 – Minority Report featuring Multitouch and Gesture-based Interaction

About the Tutorial Topic

The History of Human-Computer-Interaction



2007 – MS Surface



2009 – MS Kinect

WHAT'S YOUR BACKGROUND?

Field: Academia, Industry, Arts,...

Flavor: UX, UI, Interaction Design, Vis Design,...

Level: Master, PhD, PostDoc, Professor,...

Interaction can take many forms

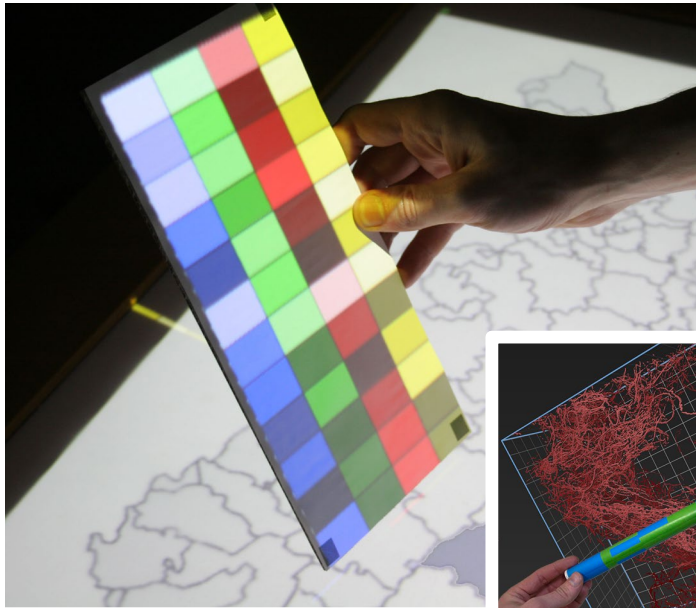


Image taken from Spindler et al. (2010)

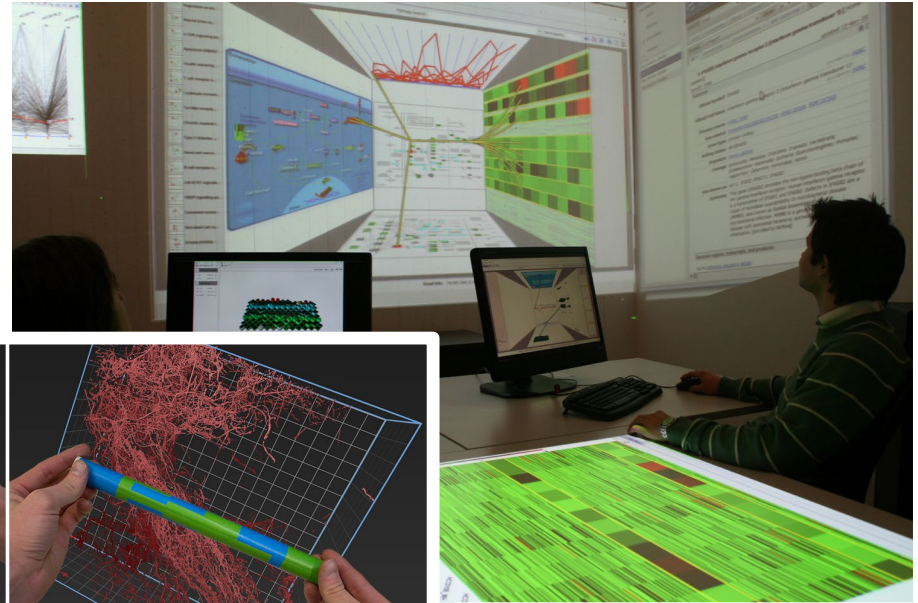


Image taken from Waldner et al. (2009)

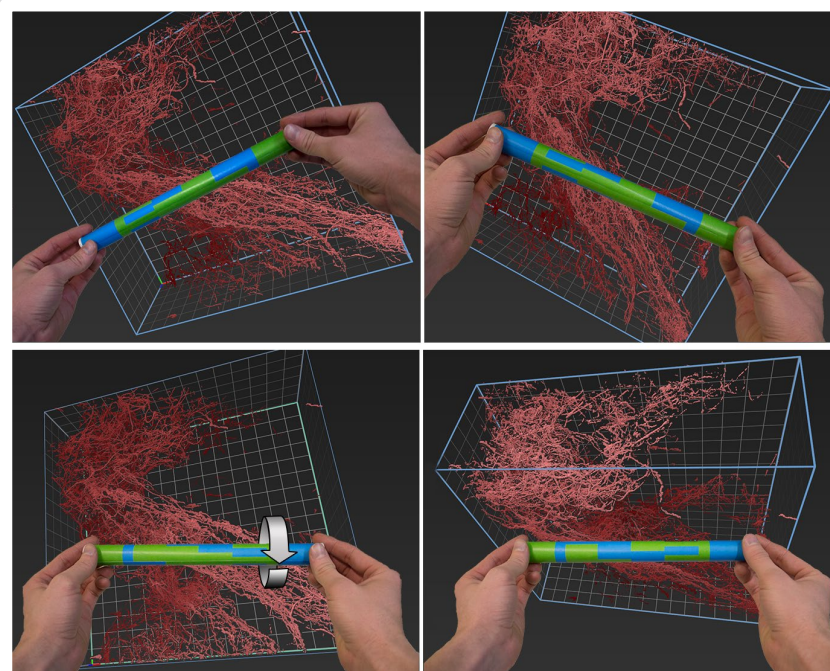


Image taken from Jackson et al. (2013)

...which makes it hard to define

*“HCI research is far from having solid
(and falsifiable) theories of interaction.”*

– Beaudouin-Lafon 2004

Interaction = direction manipulation and
instantaneous change

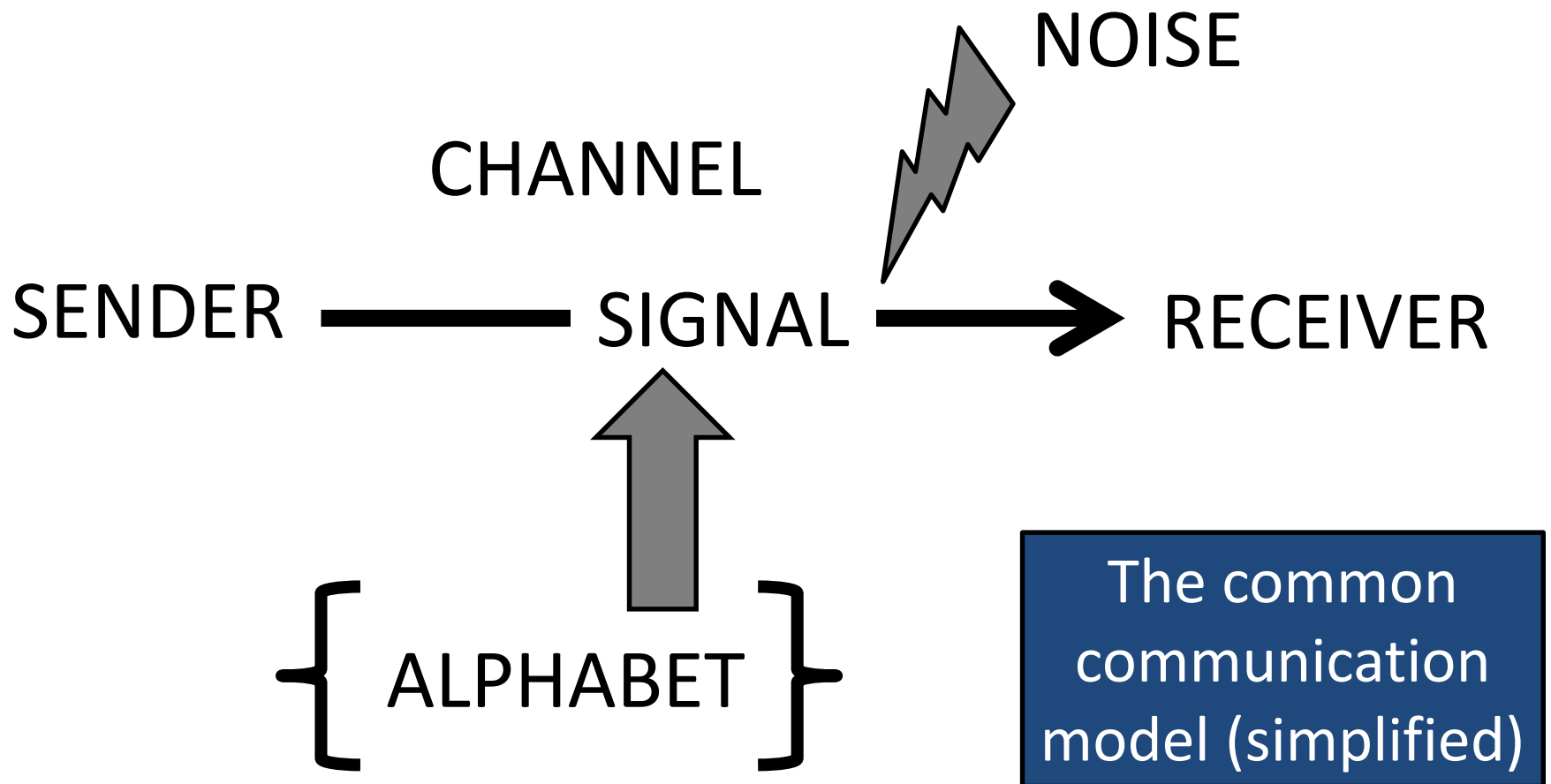
– Becker, Cleveland, Wilks 1987

Interaction = communication between user
and the system

– Dix, Finlay, Abowd, Beale 2004

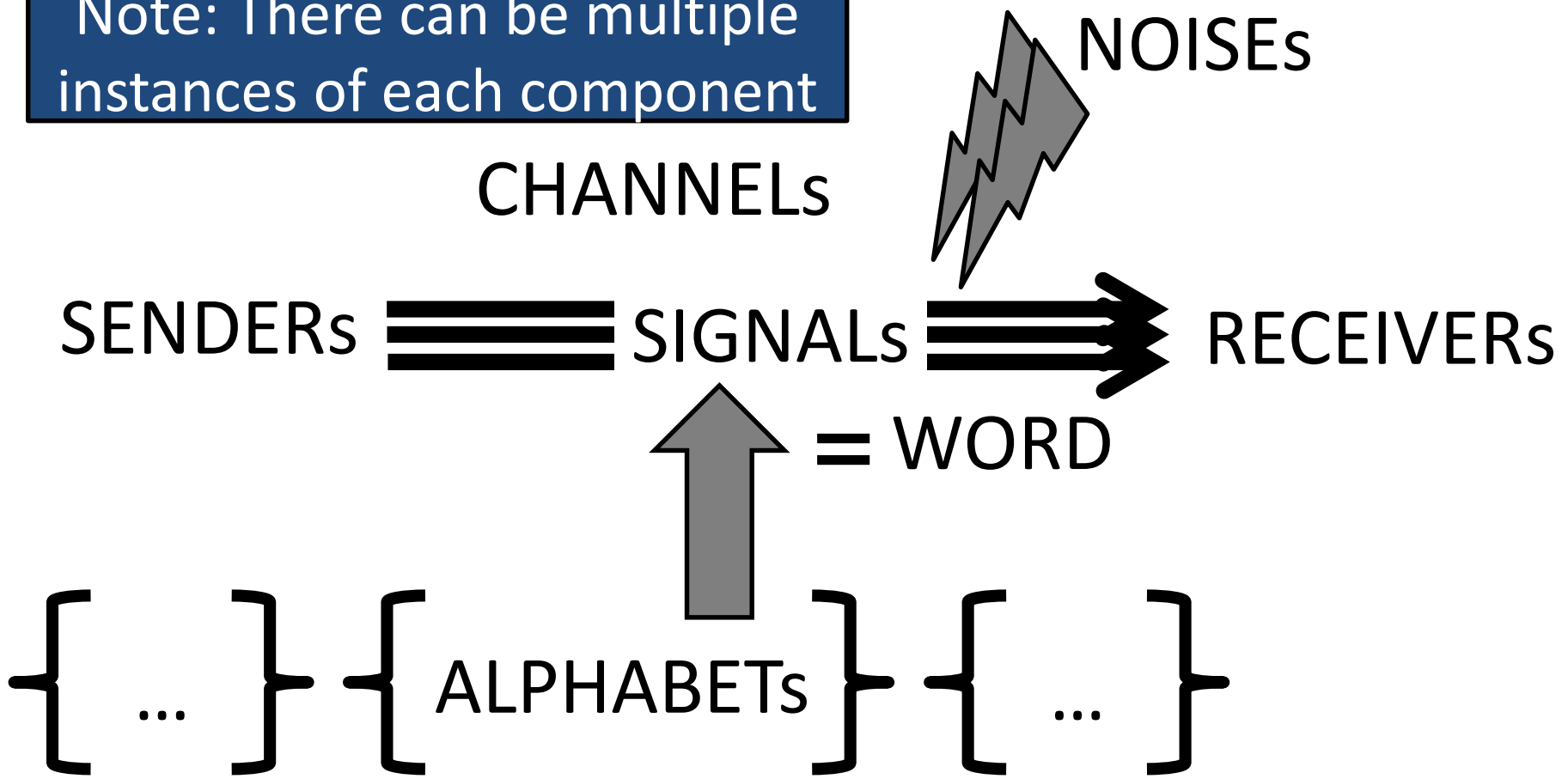
Selection taken from Yi et al. (2007)

Defining Interaction as a form of Communication

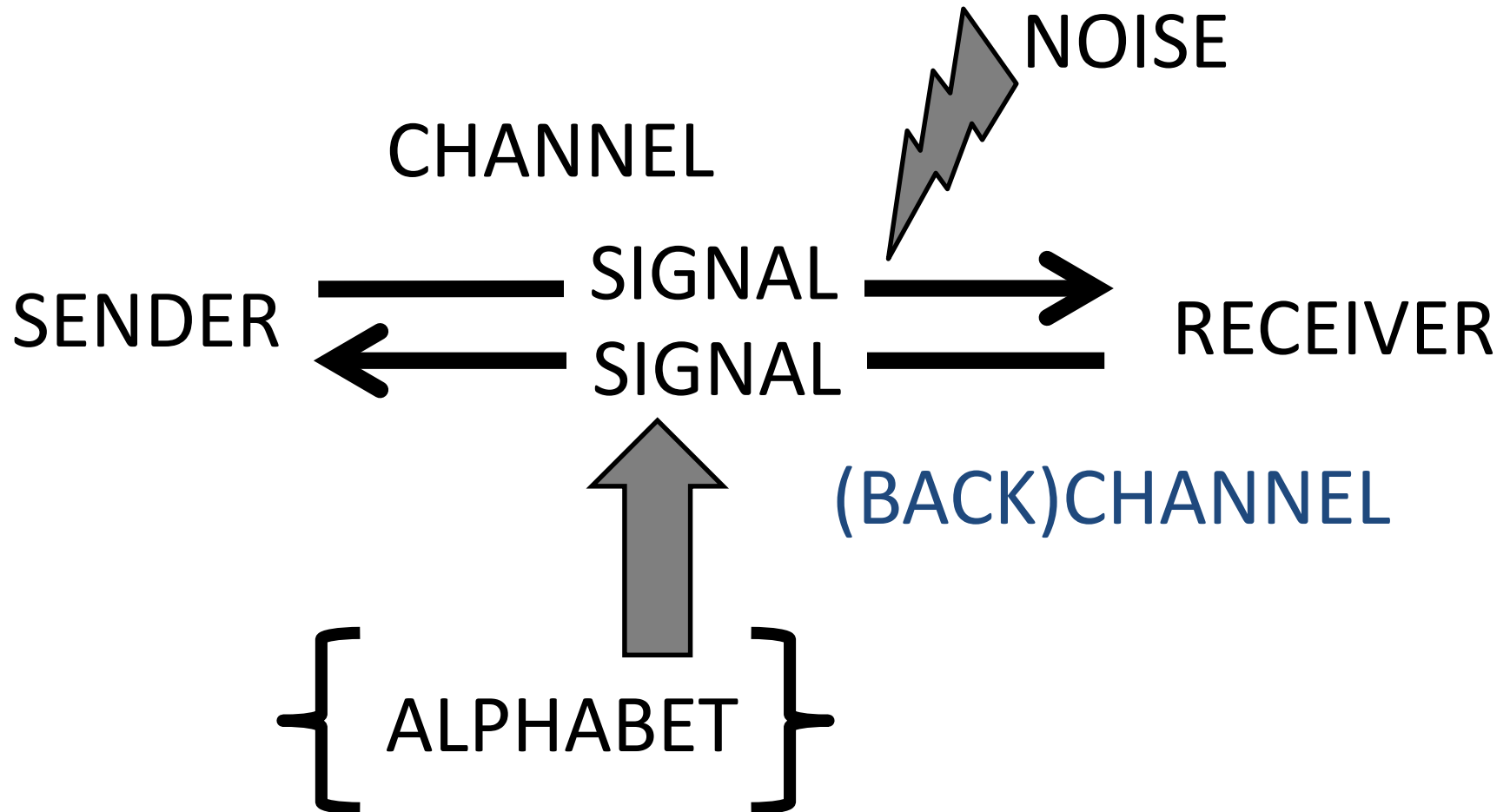


Defining Interaction as a form of Communication

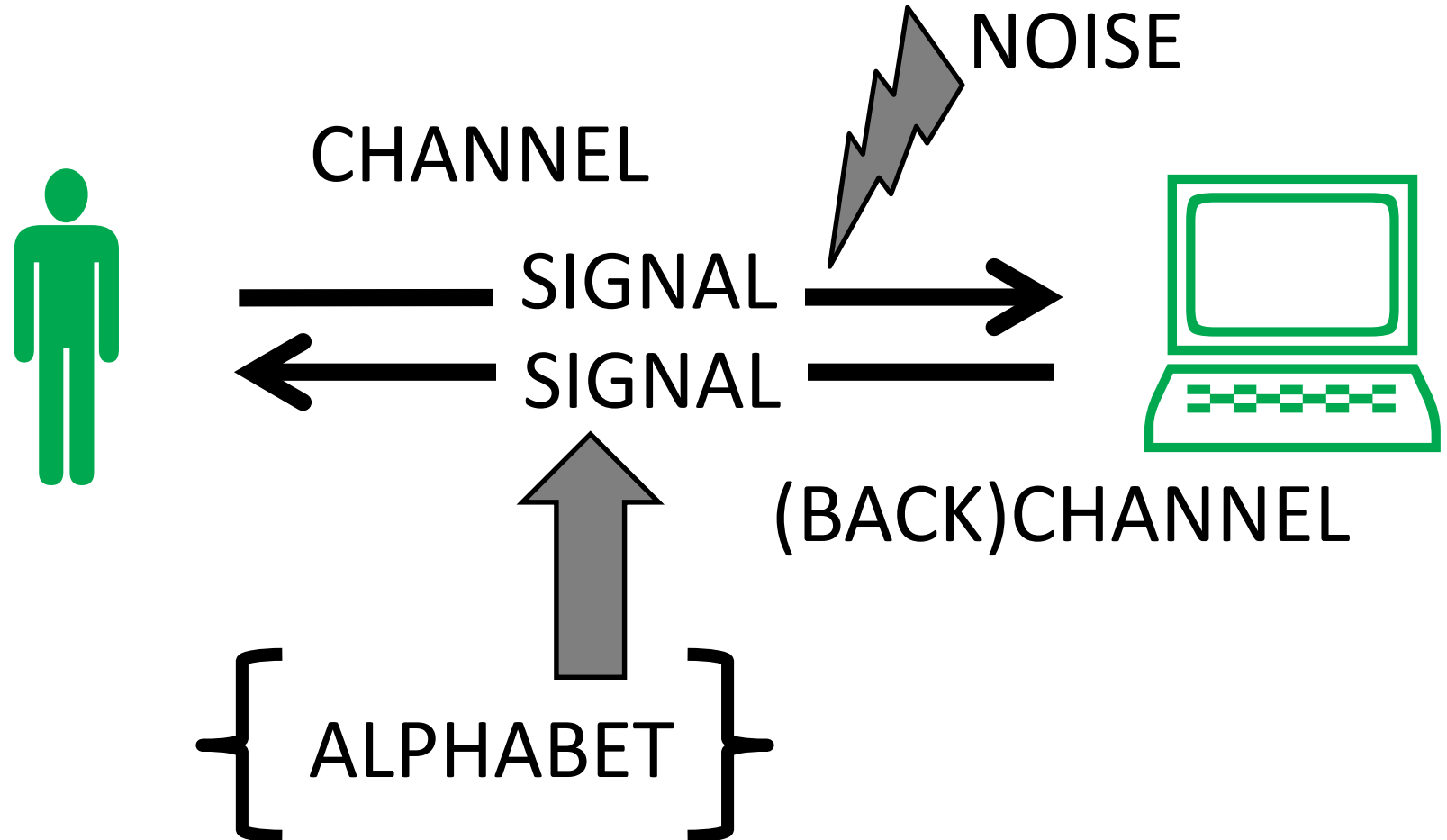
Note: There can be multiple instances of each component



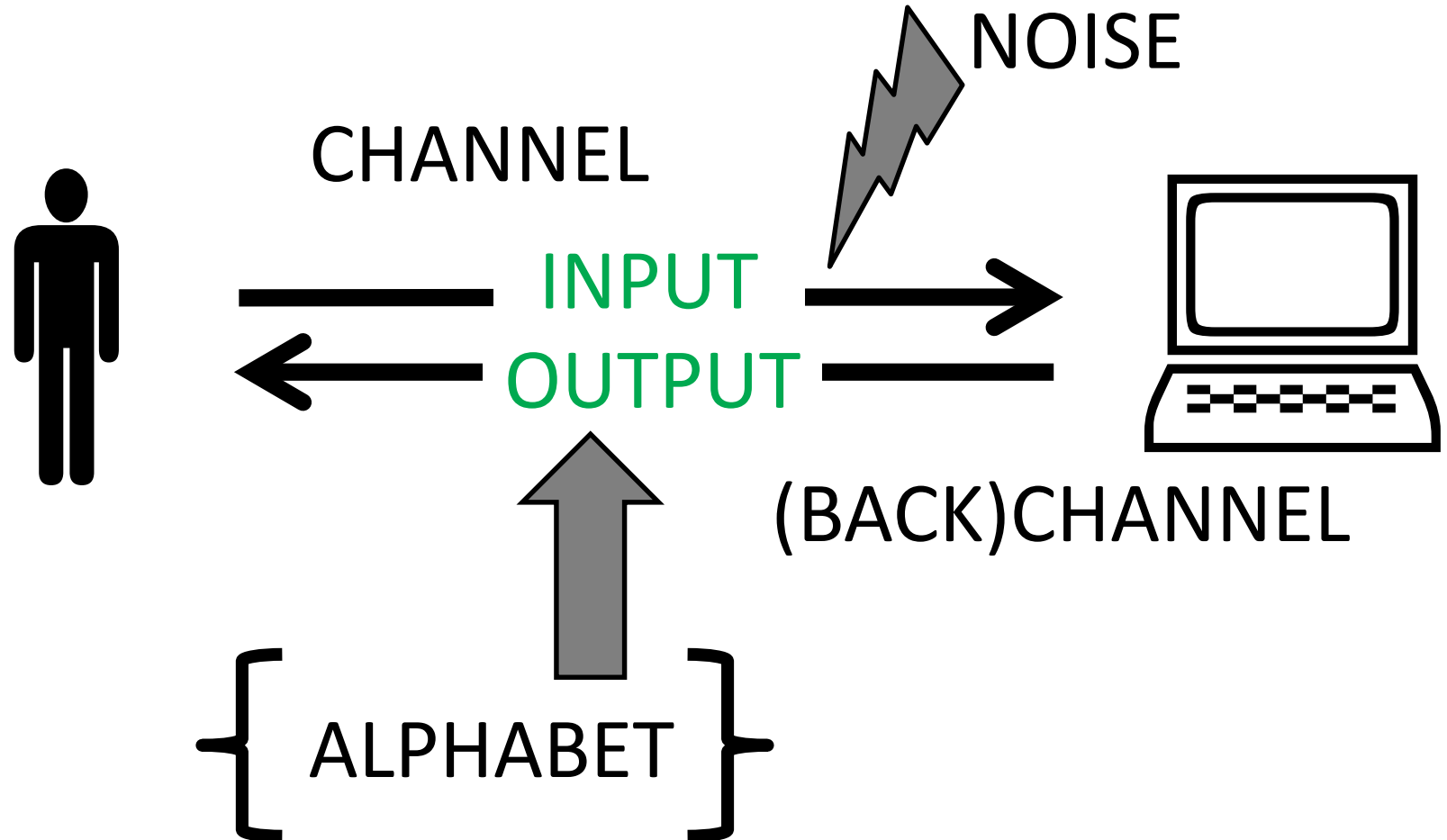
Defining Interaction as a form of Communication



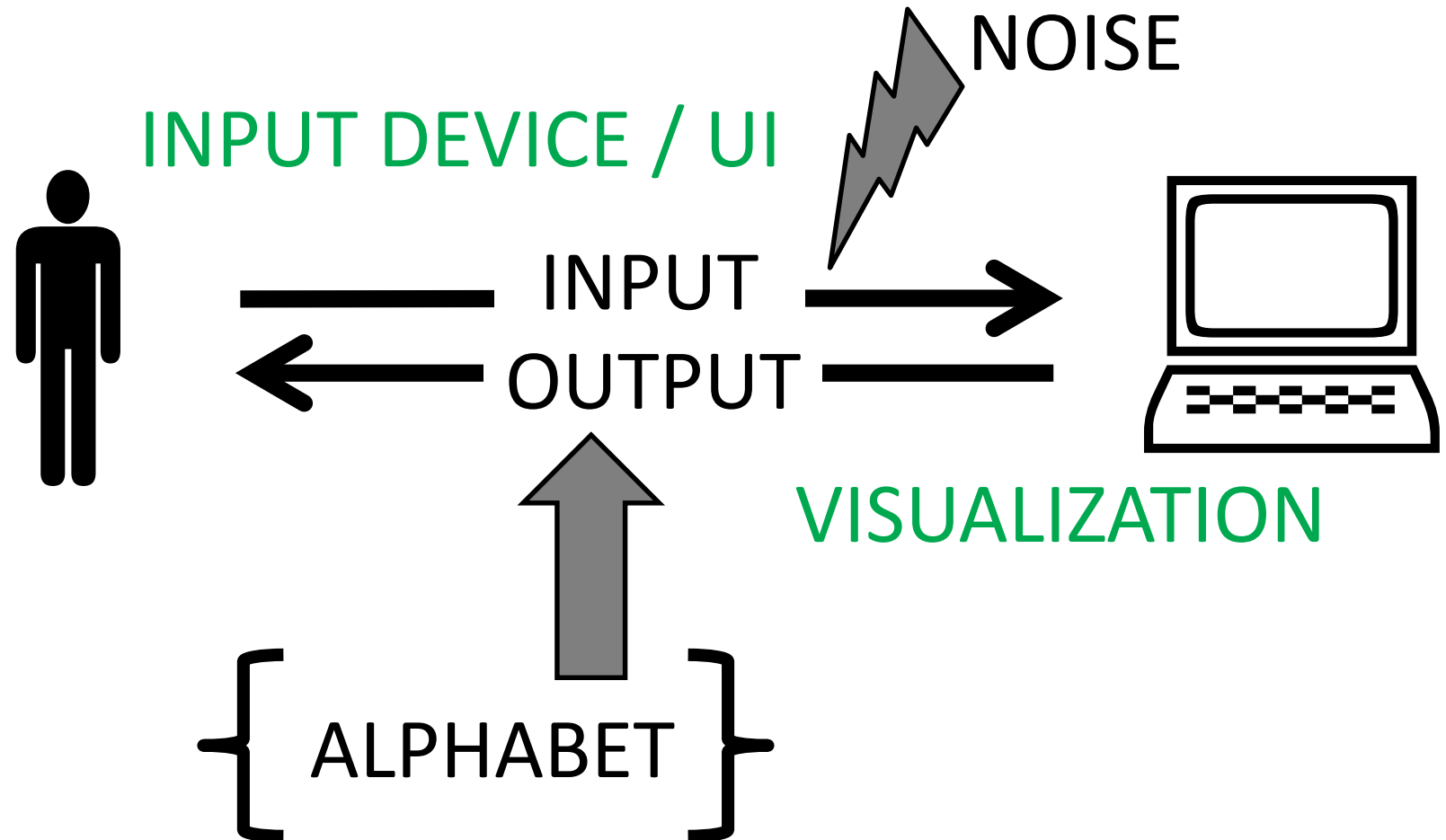
Defining Interaction as a form of Communication



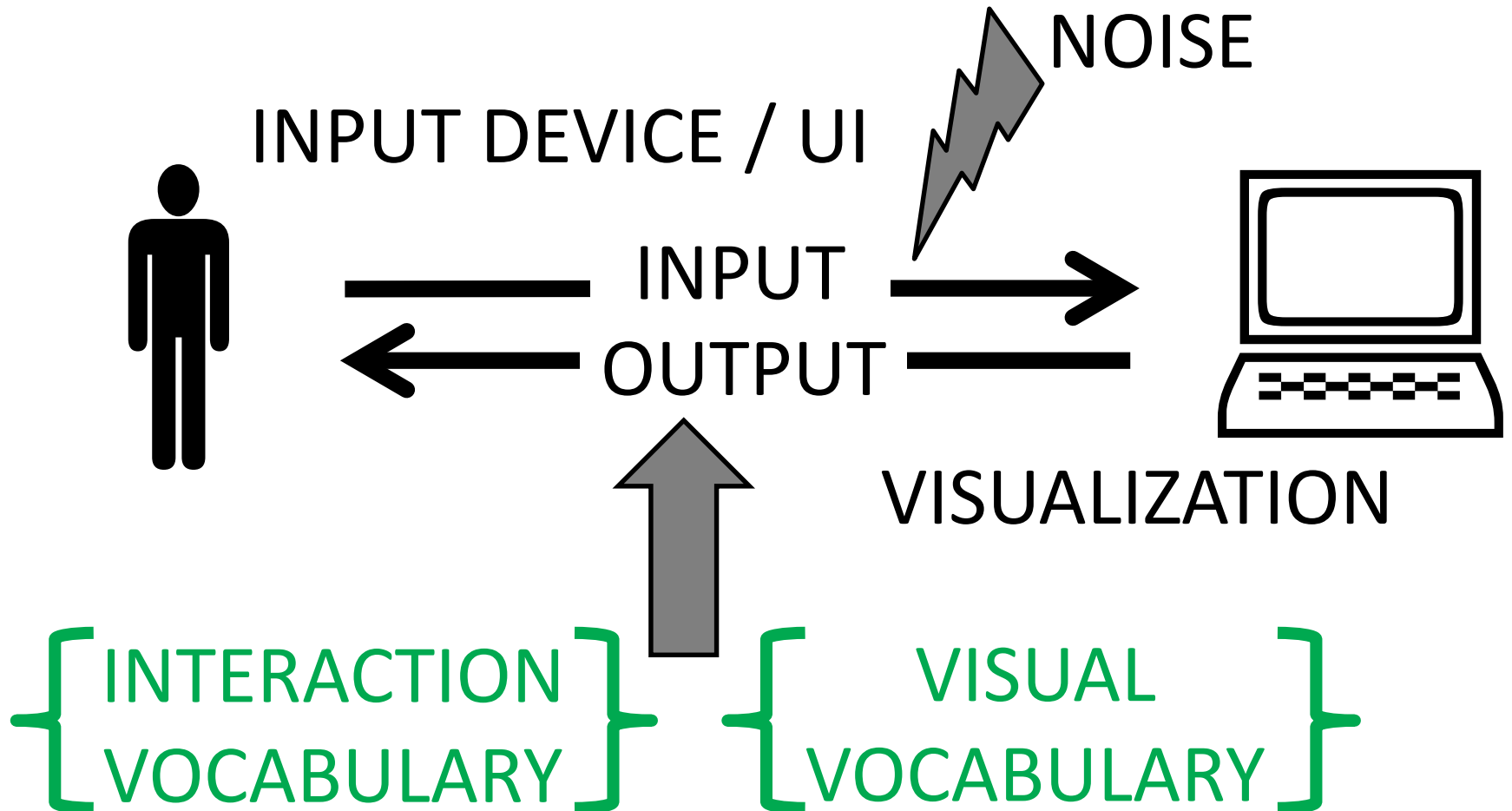
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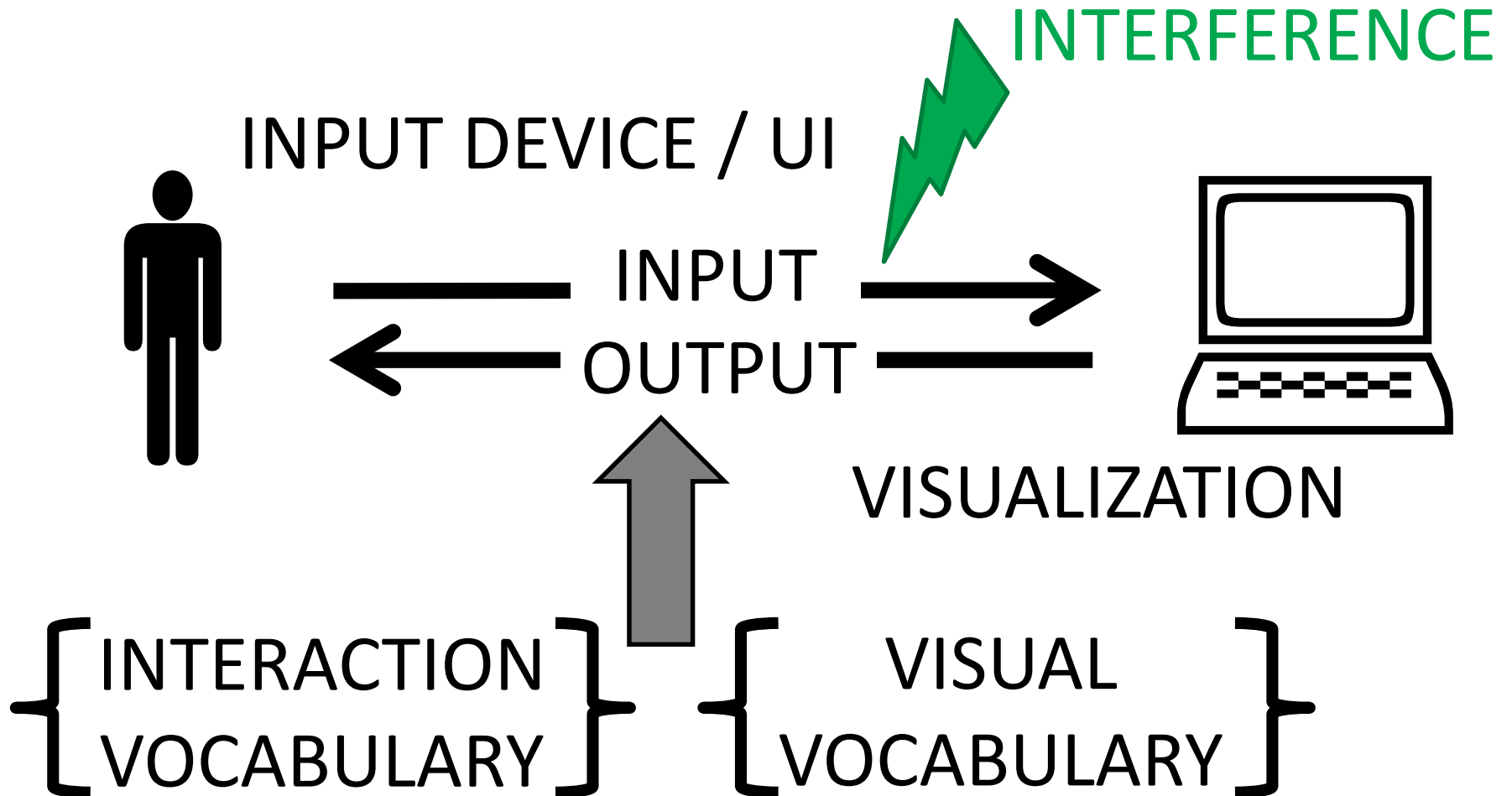
Defining Interaction as a form of Communication



Defining Interaction as a form of Communication



Defining Interaction as a form of Communication



Why do we need interaction?

“A graphic is not drawn once and for all; it is constructed and reconstructed until it reveals all the relationships constituted by the interplay of the data.”

-- J. Bertin, 1981

“Visual representations alone cannot satisfy analytical needs. Interaction techniques are required to support the dialogue between the analyst and the data.”

-- Thomas & Cook, 2005

Why do we need interaction?

Interaction techniques allow us to

- to query the data (directed search)
- to explore the data (undirected search)
- to work around problems of the visualization (occlusion,...)

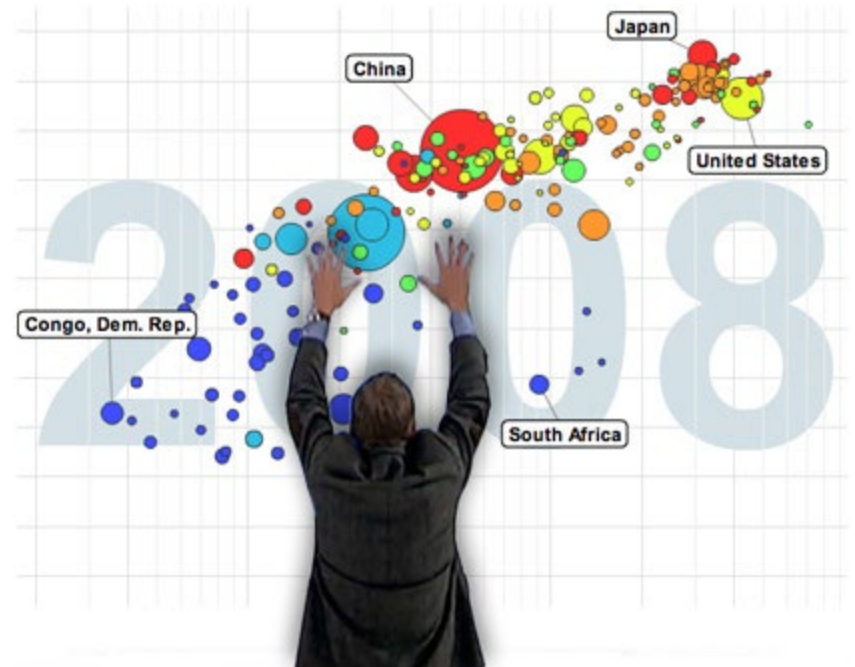
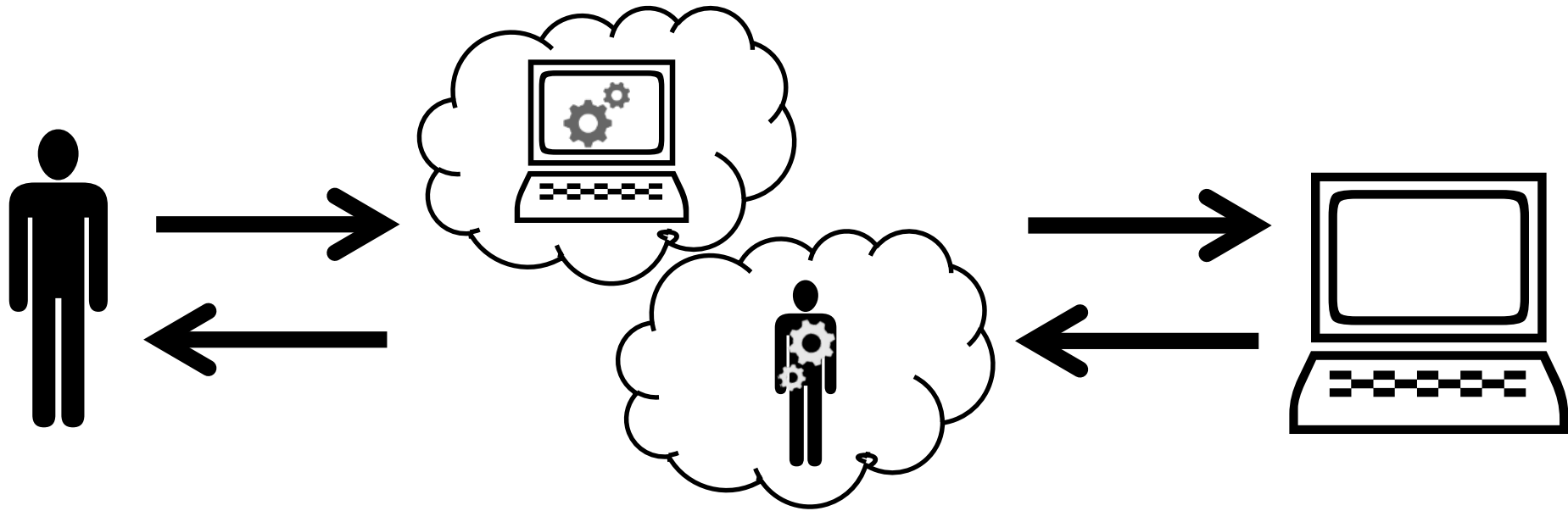


Image taken from <http://gapminder.org>

About the Tutorial Topic



Activities: What the user does to trigger a change in the computer (*Action*)

Metaphor: What the user thinks the computer is doing and vice versa (*Understanding*)

Architecture: What the computer actually does (*Reaction*)

About the Tutorial Structure

Tentative Schedule:

0. Introduction (you're listening to it right now)
14:00-14:10 (\approx 10minutes)
1. Interaction Activities
14:10-15:10 (\approx 60 minutes)
2. Interaction Architecture
15:10-15:40 (\approx 30 minutes)
15:40-16:10 coffee break
16:10-16:40 (\approx 30 minutes)
3. Interaction Metaphors and Guidelines
16:40-17:40 (\approx 60 minutes)
4. Summary and Q&A
17:40-17:55 (\approx 15 minutes)

About the Tutorial Structure

If you have remarks or questions please feel free to ask them on the spot!

Download this Slide Deck + the Literature List @
<http://tinyurl.com/tutorial2014>