

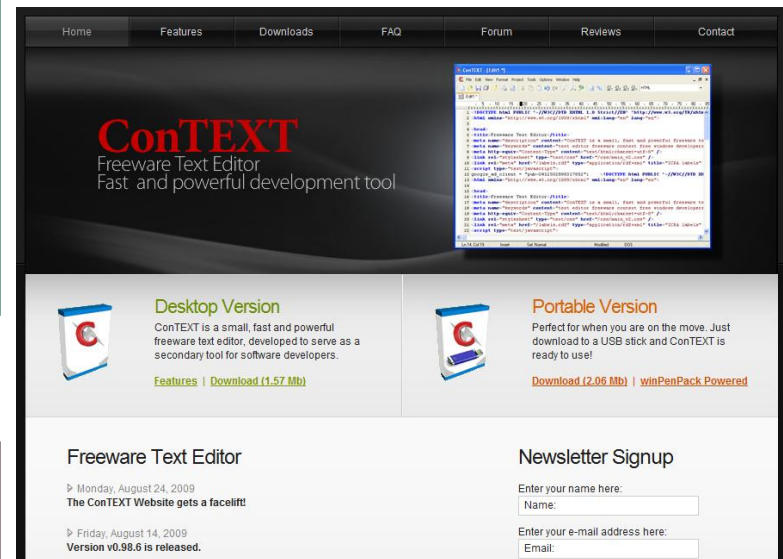
Thoughts on Context

CMSC818G

- Spring 2010
- 25 February 2010

Presenter

- Christian Almazan



Getting started...



Thinking About Context

What's Your Definition?

- We mention the word *context* frequently.
- Take out a piece of paper...
 - (or type it on your laptop)
 - ...and write your definition down.
- We will not grade you on this...
 - ...and you only have thirty seconds.

Let's Take a Survey

Groupings

- Characteristics
- Environment
- Event
- Framework
- Situation
- Surroundings
- State

Descriptions

- Identity
- Influence
- Location
- Time
- Relationships
- Relevance

Interrogative Words

- Which, What
- Whose
- Who, Whom
- What, Which
- Where
- Whence
- Whither
- When
- How
- Why, Wherefore
- Whether

Student Definitions of Context

- Did anyone have a definition without a word from the previous slide?
- Last year, 14 students asked to give their definition of context, twice.
 - Students had overlapping definitions.
 - No one matched each other definitions.
 - All students changed their definitions the second time, some more drastic than others.

Before we examine context...



What issues can arise when using context?

Time Zone Conversion Issues

Watch The Olympics: Online All Times PT | ET

LIVE Now **Coming Up** **Event Replays**

The following events will be streamed live on NBCOlympics.com

2/13 - 9:30a: ALPINE SKIING Ladies Super Combined Official Training	Alert me
2/13 - 12:00a: HOCKEY Women's Group A: Sweden vs. Switzerland	Alert me
2/13 - 12:30a: NORDIC COMBINED Nordic Combined - Official Training	Alert me
2/13 - 5:00p: HOCKEY Women's Group A: Canada vs Slovakia	Alert me

[VIEW FULL LIVE STREAMING SCHEDULE](#)

Watch The Olympics: Online All Times PT | ET

LIVE Now **Coming Up** **Event Replays**

The following events will be streamed live on NBCOlympics.com

2/13 - 12:30a: ALPINE SKIING Ladies Super Combined Official Training	Alert me
2/13 - 3:00p: HOCKEY Women's Group A: Sweden vs. Switzerland	Alert me
2/13 - 3:30p: NORDIC COMBINED Nordic Combined - Official Training	Alert me
2/13 - 8:00p: HOCKEY Women's Group A: Canada vs Slovakia	Alert me

[VIEW FULL LIVE STREAMING SCHEDULE](#)

Three Days Later...

Watch The Olympics: Online All Times PT | ET

LIVE Now **Coming Up** **Event Replays**

The following events will be streamed live on NBCOlympics.com

2/16 - 9:00a: CURLING Men's prelims: United States vs Germany	Alert me
2/16 - 9:00a: CURLING Men's prelims: Great Britain vs Sweden	Alert me
2/16 - 9:00a: CURLING Men's prelims: Switzerland vs Denmark	Alert me
2/16 - 9:00a: CURLING Men's prelims: Norway vs Canada	Alert me

[VIEW FULL LIVE STREAMING SCHEDULE](#)

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[VIEW FULL LIVE STREAMING SCHEDULE](#)

Nordic Combined – Ski Jumping

RANK	BIB	TEAM	SPEED (MPH)	DISTANCE (M)	DISTANCE POINTS	JUDGES MARKS					JUDGES POINTS	ROUND POINTS	CC START TIME DIFF.
						A	B	C	D	E			
1	5	 Finland										507.0	-
	5-1	RYYNAENEN Janne	59.5	138.5	80.2	18.0	18.5	18.0	18.0	18.0	54.0	134.2	
	5-2	TALLUS Jaakko	59.4	129.5	66.8	18.0	18.0	18.5	17.5	17.5	53.5	120.3	
	5-3	MANNINEN Hannu	60.0	130.0	67.5	18.0	17.5	18.0	17.5	17.5	53.0	120.5	
	5-4	KOIVURANTA Anssi	59.4	136.0	76.5	18.5	18.5	18.5	18.5	18.5	55.5	132.0	
2	6	 United States										505.8	+00:02
	6-1	CAMEROTA Brett	59.1	133.5	72.8	16.5	17.5	16.5	16.5	16.5	49.5	122.3	
	6-2	LODWICK Todd	59.7	136.5	77.2	18.5	18.5	18.5	18.0	18.0	55.0	132.2	
	6-3	DEMONG Bill	59.9	131.5	69.8	18.0	18.0	18.0	18.0	18.0	54.0	123.8	
	6-4	SPILLANE Johnny	59.6	134.0	73.5	18.0	18.0	18.0	18.0	18.5	54.0	127.5	

Ski Jumping – Speed?

RANK	BIB	TEAM	SPEED (MPH)	DISTANCE (M)	DISTANCE POINTS	JUDGES MARKS					JUDGES POINTS	ROUND POINTS	GRP RANK	TOTAL
						A	B	C	D	E				
1	12	 Austria										547.3	1	547.3
	12-1	LOITZL Wolfgang	94.7	138.0	83.4	19.0	19.0	19.0	19.0	19.0	57.0	140.4	1	
	12-2	KOFLER Andreas	93.9	132.0	72.6	17.5	18.0	17.5	18.0	18.0	53.5	126.1	1	
	12-3	MORGENSTERN Thomas	94.8	135.5	78.9	19.0	19.0	19.0	19.0	19.0	57.0	135.9	1	
	12-4	SCHLIERENZAUER Gregor	93.8	140.5	87.9	19.0	19.0	19.0	19.0	19.0	57.0	144.9	1	
2	11	 Germany										509.3	2	509.3
	11-1	NEUMAYER Michael	94.6	137.0	81.6	17.5	18.0	18.5	18.0	18.0	54.0	135.6	2	
	11-2	WANK Andreas	94.6	128.5	66.3	18.0	18.0	17.5	18.0	18.0	54.0	120.3	4	
	11-3	SCHMITT Martin	94.1	128.0	65.4	17.5	18.0	18.0	18.5	18.5	54.5	119.9	4	
	11-4	UHRMANN Michael	93.9	135.0	78.0	18.0	18.5	18.5	18.5	18.5	55.5	133.5	4	

Numbers Not Converted

Rank^	Start Order	Country	Team	Group 1 Pts	Group 2 Pts	Group 3 Pts	Group 4 Pts	Team Total	Note	+		
1	12		Austria	140.4	126.1	135.9	144.9	547.3	Q	-		
Name	Bib	Speed (km/h)	Distance (m)	Pts	Judges					Judges Pts	Total Pts	Grp. Rank
LOITZL Wolfgang	12-1	94.7	138.0	83.4	49.0	19.0	19.0	49.0	19.0	57.0	140.4	1
KOFLER Andreas	12-2	93.9	132.0	72.6	47.5	18.0	17.5	48.0	18.0	53.5	126.1	1
MORGENSTERN Thomas	12-3	94.8	135.5	78.9	19.0	19.0	49.0	19.0	49.0	57.0	135.9	1
SCHLIERENZAUER Gregor	12-4	93.8	140.5	87.9	49.0	19.0	19.0	49.0	19.0	57.0	144.9	1
2	11		Germany	135.6	120.3	119.9	133.5	509.3	Q	-		
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UHRMANN Michael	11-4	93.9	135.0	78.0	48.0	18.5	48.5	18.5	18.5	55.5	133.5	4

Understanding without Context?

- What does the term *Rabbit* mean to you?
- PHIL858P – What is Information?
 - I took this course in Fall 2004.
 - What was this class about?

Rabbit – Animals



Rabbit – Microprocessor



Rabbit – Automobile



PHIL818P – Course Information

- Taught by Professor Jeffrey Bub.
 - Ph.D. in Mathematical Physics (1966)
 - Distinguished University Professor
 - Department of Philosophy
 - Foundations of Physics Group
 - Philosophy of the Sciences
 - Institute for Physical Science and Technology

Class – Quantum Information

Representative Publications

Interpreting the Quantum World (Cambridge: Cambridge University Press, 1997). Winner of the Lakatos Award, 1998.

The Interpretation of Quantum Mechanics (Dordrecht: Reidel, 1974).

'Quantum Information and Quantum Computing,' forthcoming in John Earman and Jeremy Butterfield (eds.), *Handbook of Philosophy of Physics* (North-Holland, 2006), 103 pp.

'Quantum Mechanics is About Quantum Information,' *Foundations of Physics* **35**, 541 - 560 (2005).

'Why the Quantum?' *Studies in the History and Philosophy of Modern Physics* **35**, 241 - 266 (2004).

'Characterizing Quantum Theory in Terms of Information-Theoretic Constraints,' *Foundations of Physics* **33**, 1561 - 1591 (2003). (Co-authored with Rob Clifton and Hans Halvorson.)

'The Quantum Bit Commitment Theorem,' *Foundations of Physics* **31**, 735 - 756 (2001).

'Secure Key Distribution via Pre- and Postselected Quantum States,' *Physical Review A* **63**, 032309 - 032311 (2001).

'Schütte's Tautology and the Kochen-Specker Theorem,' *Foundations of Physics* **26**, 787 - 806 (1996). Festschrift issue for Max Jammer's 80th birthday.

'A Uniqueness Theorem for 'No Collapse' Interpretations of Quantum Mechanics,' *Studies in the History and Philosophy of Physics* **27**, 181 - 219 (1996). (Co-authored with R. Clifton.)

'A Proposed Solution of the Measurement Problem in Quantum Mechanics by a Hidden Variable Theory,' *Reviews of Modern Physics* **38**, 453 - 469 (1966). (Co-authored with D. Bohm)

Basic Context Issues

- Sporting Event
 - Incorrect Data Transformations
 - No Transformation Performed
 - Specified Units Incorrect
- Missing Context
 - Devoid of any context, cannot really tell *what someone thinks or wants to convey*.
 - If we cannot answer a question immediately, we attempt to build up *context*.

We need to understand something first...



An Aside on Information

Information Types

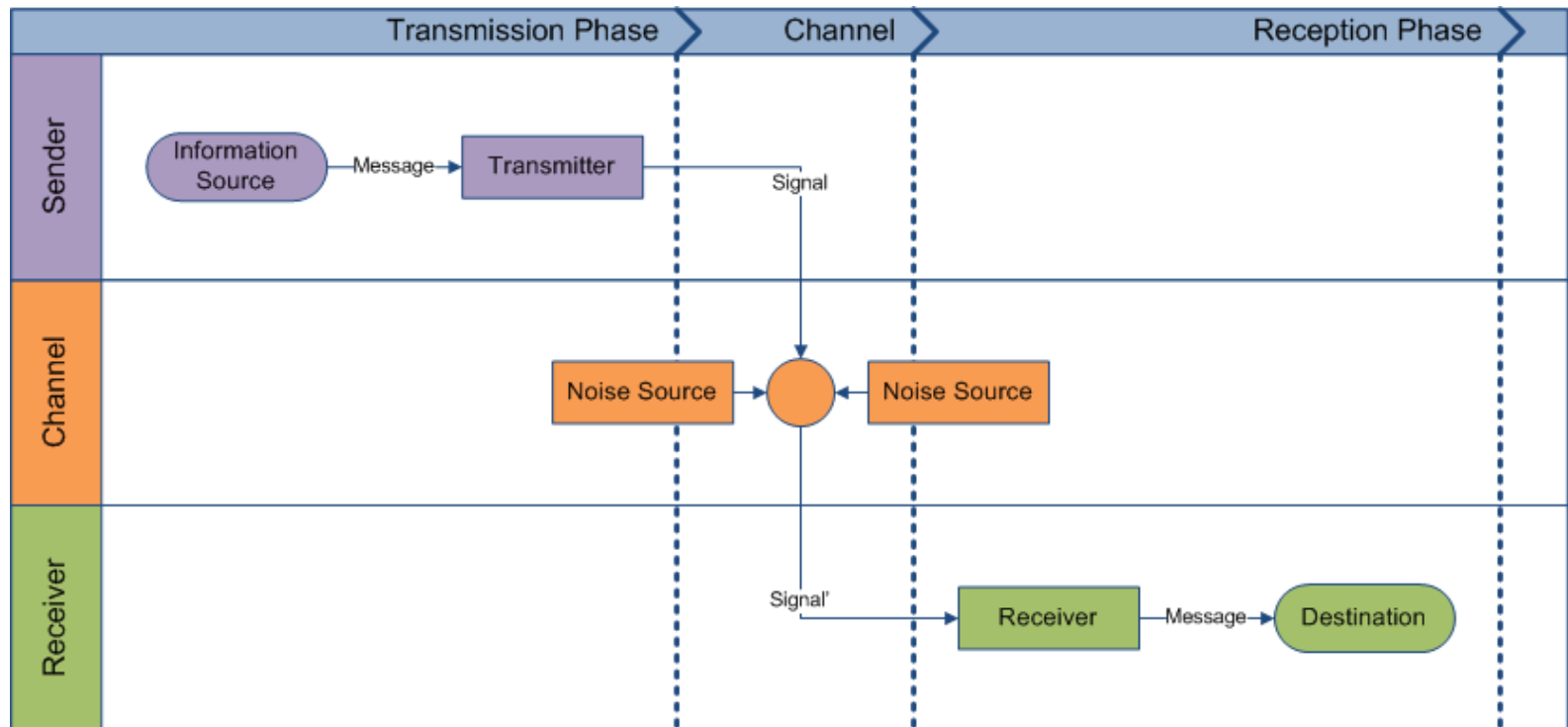
Technical Information

- “Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem.” – Shannon

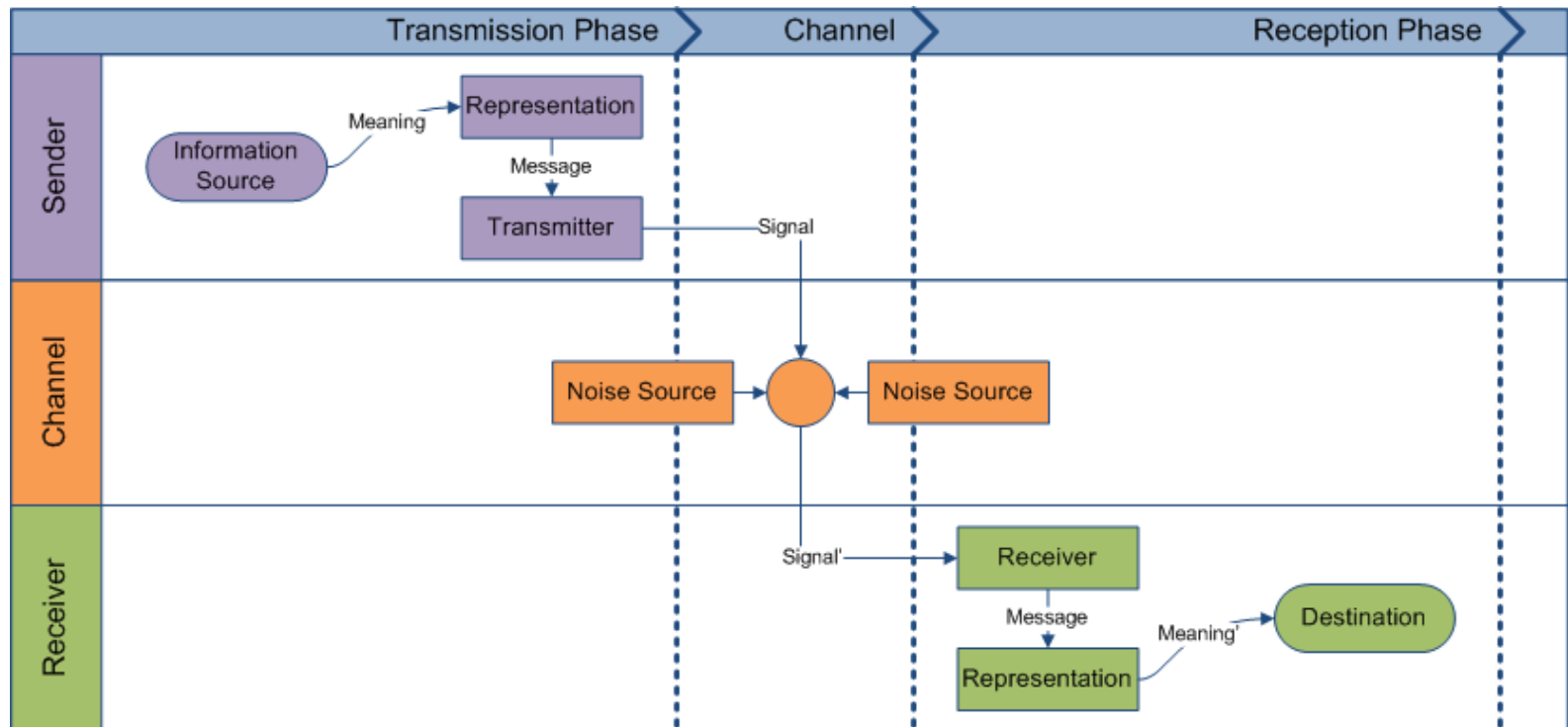
Everyday Information

- The natural use of language and communication between people, typically involving understand and meaning.

Technical Information



Everyday Information



Just a sampling of...



Definitions of Context

Thoughts Before Moving Forward

- “Although frequently used in cognitive sciences or other disciplines, context stays a very ill-defined concept.”
 - Bazire and Brézillon
- We cannot possibly predefine the entire context possible since the environment it exists within changes frequently.
 - Coutaz, Crowley, Dobson, and Garlan

Dictionary Definitions

Etymology

- From the Latin *contextus*
- “to weave together”

Merriam-Webster

- “the part of a discourse **that surround** a word or passage and can throw light on its meaning”
- “the interrelated conditions **in which** something exists or occurs : environment, setting”

WordNet

- “discourse **that surrounds** a language unit and helps to determine its interpretation”
- “the set of facts or circumstances **that surround** a situation or event”

Hints to Learn Word Meaning

Drum / Konopak

Perceptual	• Similar sound words.
Syntactic	• Internal structure or grammatical function of words.
Semantic	• General meaning dimensions of a word.
Correct	• A specific definition.

Sternberg

Temporal	Spatial
Value	Static
Functional Descriptive	Causal/Enablement
Class Membership	Equivalence

Computer Science Terminology

Definitions

Traditional Definition

- “that which surrounds, and gives meaning to, something else”

Theory of Computation

- “in a grammar it refers to the symbols before and after the symbol under construction”

Terminology

Context-Sensitive Help

Contextual Search

Multitasking Context Switch

Context-Sensitive Menu

Context-Aware Computing (I)

Schilit / Theimer

- Location, spatially close people and objects, and the changes to people and objects.

Schilit / Adams / Want

- Where you are.
- Who you are with.
- What resources are nearby.
- *Things of Interest* move and change over time.
 - *Lighting, noise level, network connectivity, communication costs, communication bandwidth, and social situations.*

Context-Aware Computing (2)

Brown

- Context, when attached to an electronic note, consists of anything part of that note's environment.
- Location, proximity of objects, critical states, computer states, imaginary states, and time.

Pascoe

- Any physical or conceptual states relevant to an entity in nearby environments.

Engelhardt / Schmidt

- Relationships of hypertext documents through linking.

Bazire / Brézillon

- Constraints of a Given Tasks.

Dey's Formal Definition

Issues

Dictionary Definitions

- Should not be considered sufficient or used directly.

Synonyms of Context

- Difficult to apply in practice.

Specific Definitions

- Limited scope, not widely applicable.

Definition

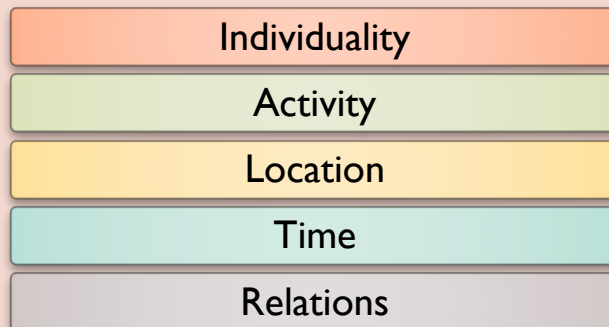
Context is any information that can be used to characterize the situation of an *entity*.

An *entity* is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and application themselves.

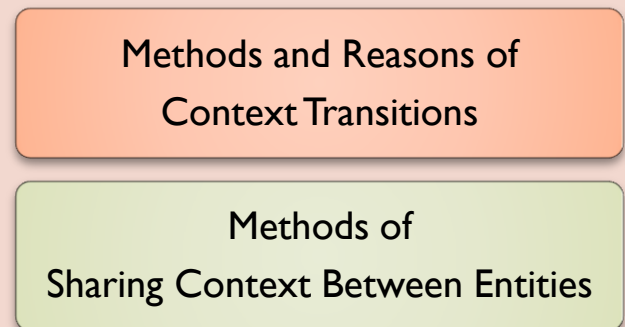
Operational Definition

- Dey provides only a formal definition without regard to the practice of using context in an operational environment.
 - Zimmermann, Lorenz, and Oppermann

Categories

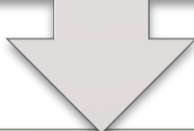


Operations

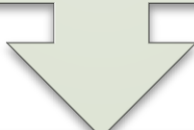


Our Definition of Context

Context consists of one or more relationships an information item has to another information item.



An information item can be any entity, either physical (such as a person, a computer, an object), virtual (such as a computer service, a group of people, a message), or a concept (location, time, and so on).



A relationship describes a predicate connecting two or more information items.

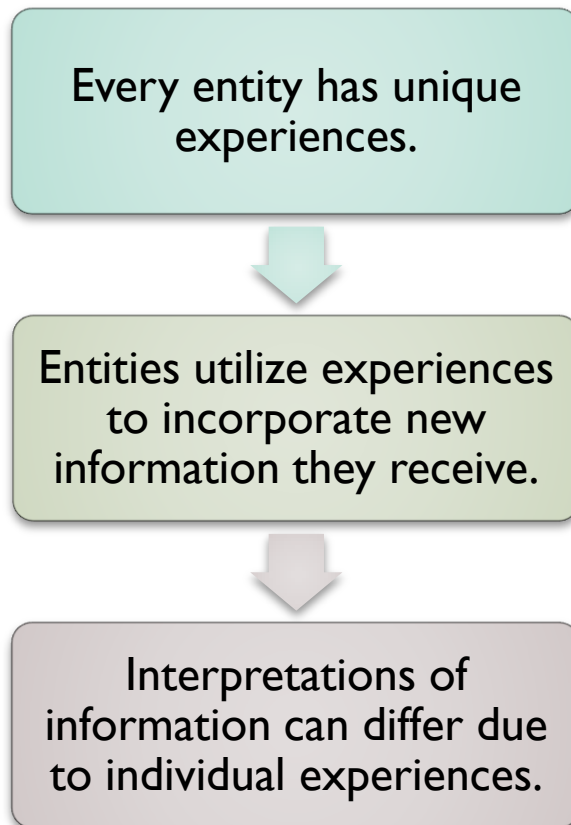
Aspects of Context (I)



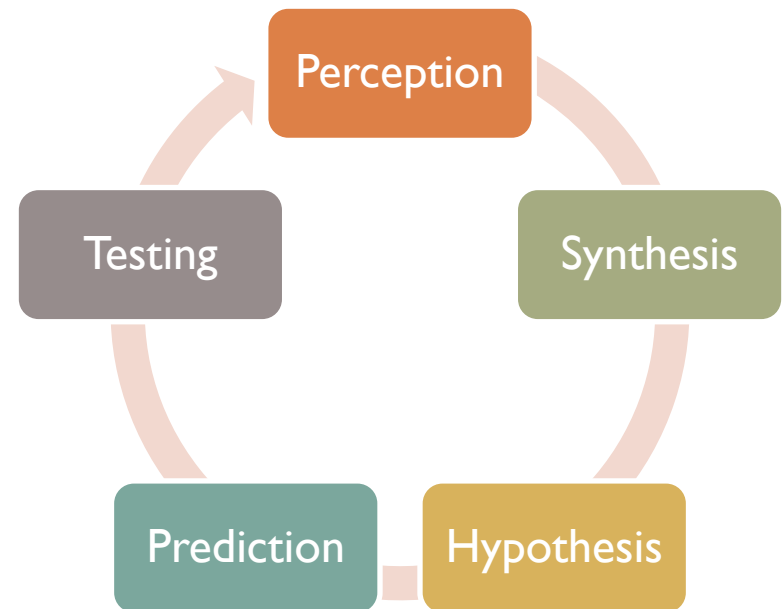
Considerations on the Use of Context

Interpretation Issues

Experiences



McComb's Model



Cultural Issues

- We utilize and specify context with respect to cultural influences.
- We assimilate information from divergent and heterogeneous data sources.
 - Each may have relevant data.
 - May not match due to cultural formatting.
- Example: 02/03/2009
 - February 3, 2009 or March 2, 2009?

Abstraction Issues

- Whether they explicitly recognize this or not – we use abstractions every day.
- How does this affect context?
 - We do not always need the lowest level of detail for a piece of context.
 - We may need to group related pieces of context together.

Accuracy versus Resolution

- Accuracy
 - How exact does a value have to be?
 - Ten meter accuracy from a coordinate given.
 - Measure error between the measured value and the actual value.
- Resolution
 - How far apart a value can be measured?
 - City-Level Resolution vs. Coordinates
- What would suit an application?

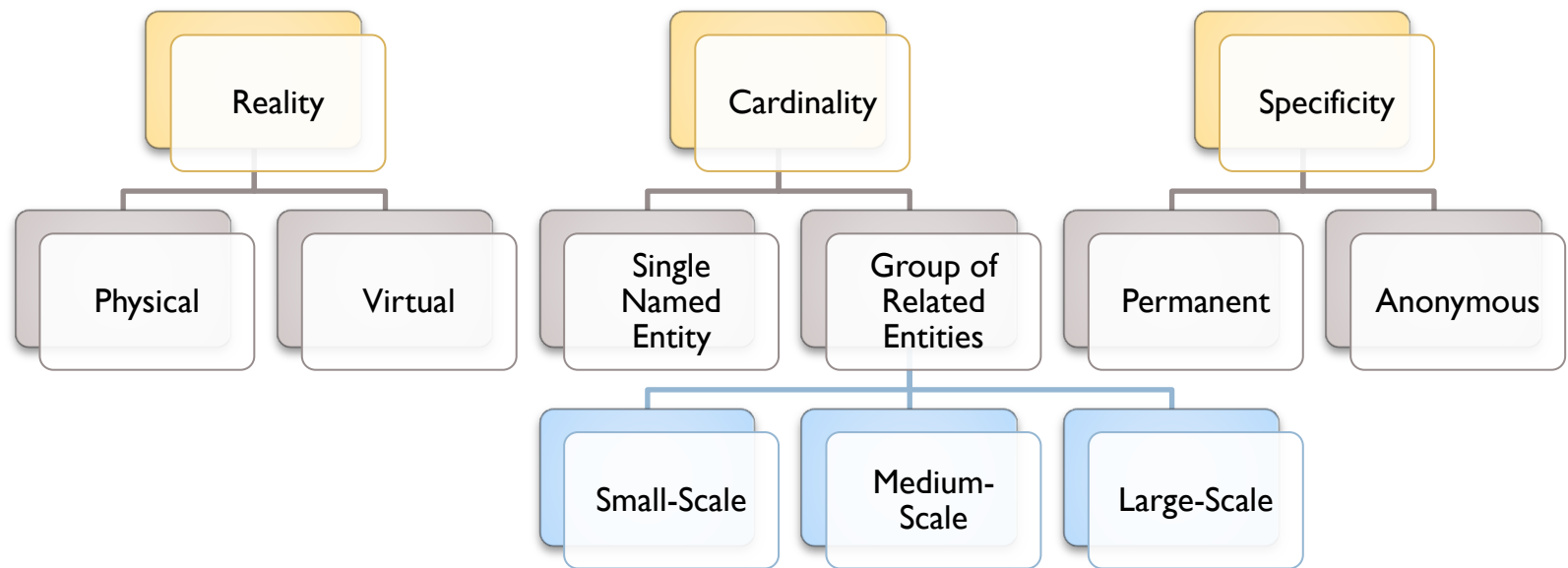
Aspects of Context (2)



Critical Aspects of Context

Identity

- Entities (information items) have names.
- One of the most crucial aspects of developing computer systems.



Time

- We live in a causal universe.
 - Anyone supporting a non-causal universe?
- Absolute versus Relative
 - Absolute – with respect to a global clock
 - Relative – starting from a specific point
- Representations of Time
 - Numerical Digit
 - Specific Date and Time
 - Execution Graph

Location – Importance / Types

- Whether physical or virtual, everything happens at a location.
- Physical versus Logical
 - Physical – a place in the world
 - Logical – a place in a computer system
- Absolute versus Relative
 - Absolute – *shared reference grid*
 - Relative – *with respect to* a frame of reference

Location – Representations

Coordinate / Physical

- (x, y, z)

Semantic

- building → room → floor
- country → state → city

Symbolic

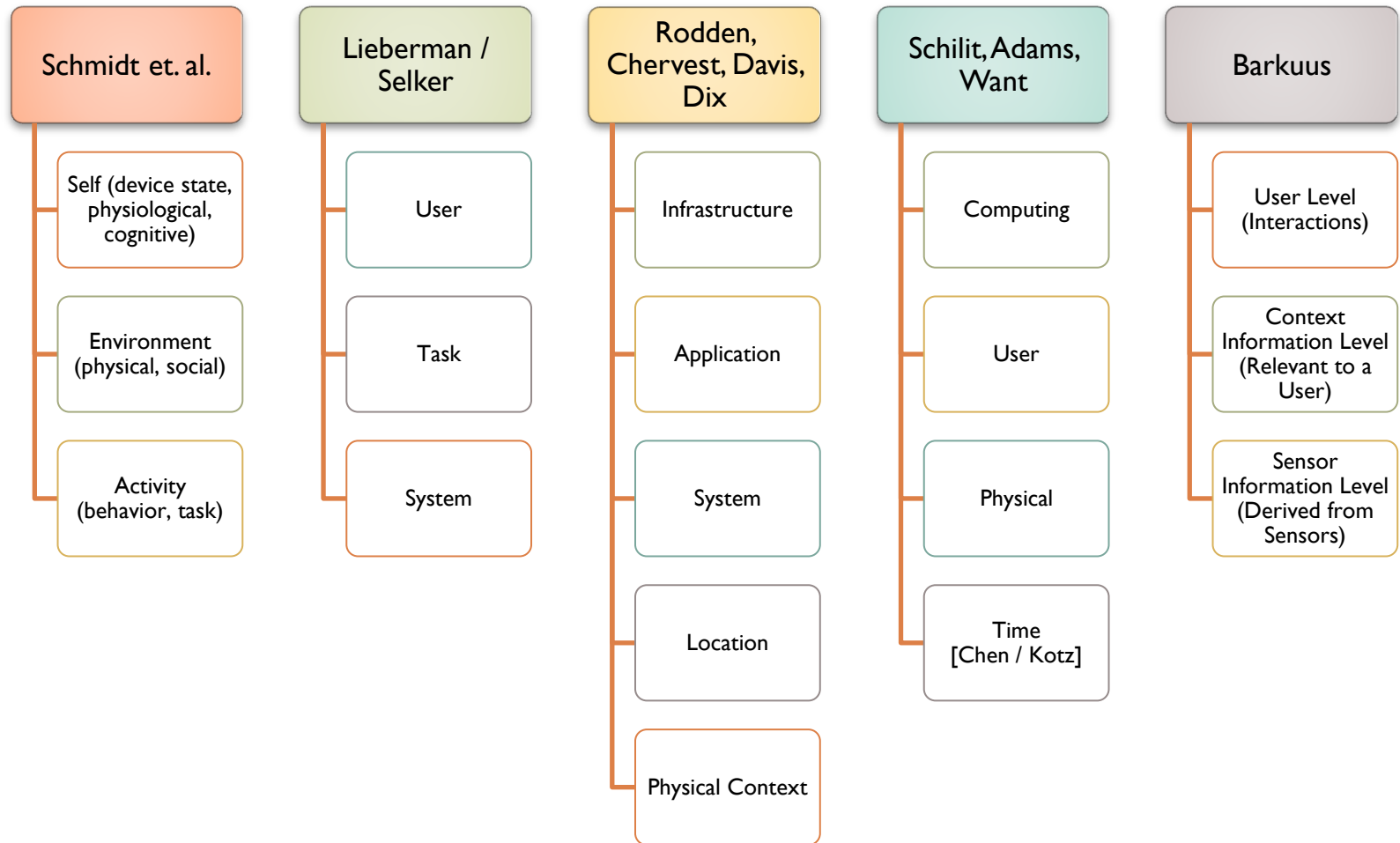
- on a train approaching Denver
- next to a mailbox
- in the kitchen

Aspects of Context (3)



Categorizing Context

High Level Groupings



Low Level Groupings

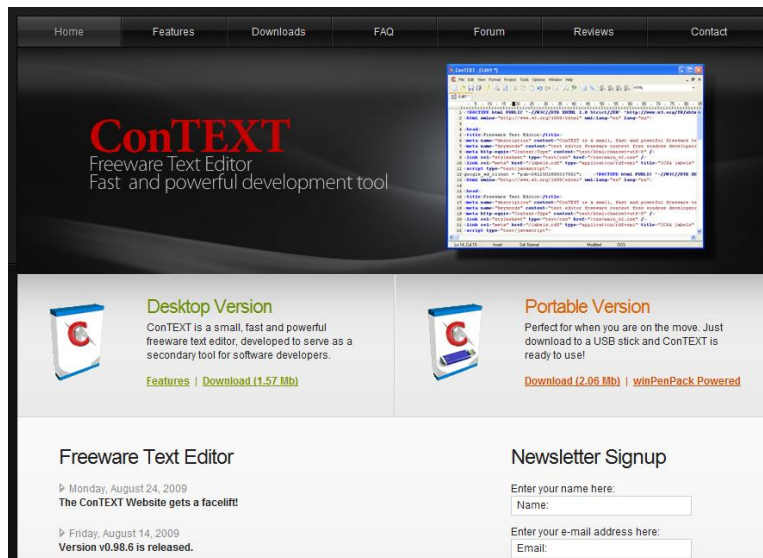
[RCDD]

Space	Time	Real versus Virtual	Mobility by Movement	Mobility by Device Type
Cardinality	Entity Type	Presence	Identity	Attributes

[CK]

Location	Time	Nearby Objects	Network Bandwidth	Light
Tilt	Vibration	Proximity	Sound	Temperature

Discussion



- Searching the Internet to find a definition of context?

← First Search Result

- Google
- Bing