

# Towards Scatterbox: A Context-Aware Message Forwarding Platform



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# Pervasive Computing

- “Smart” Environment
- Mobile Users
- New forms of HCI
- Mobile devices
  - Used to pass information to users



# The Challenges in Pervasive Systems

- **Information Overload**

- Cut down number of messages being passed
- User's time and attention are limited

- **Need for Policies**

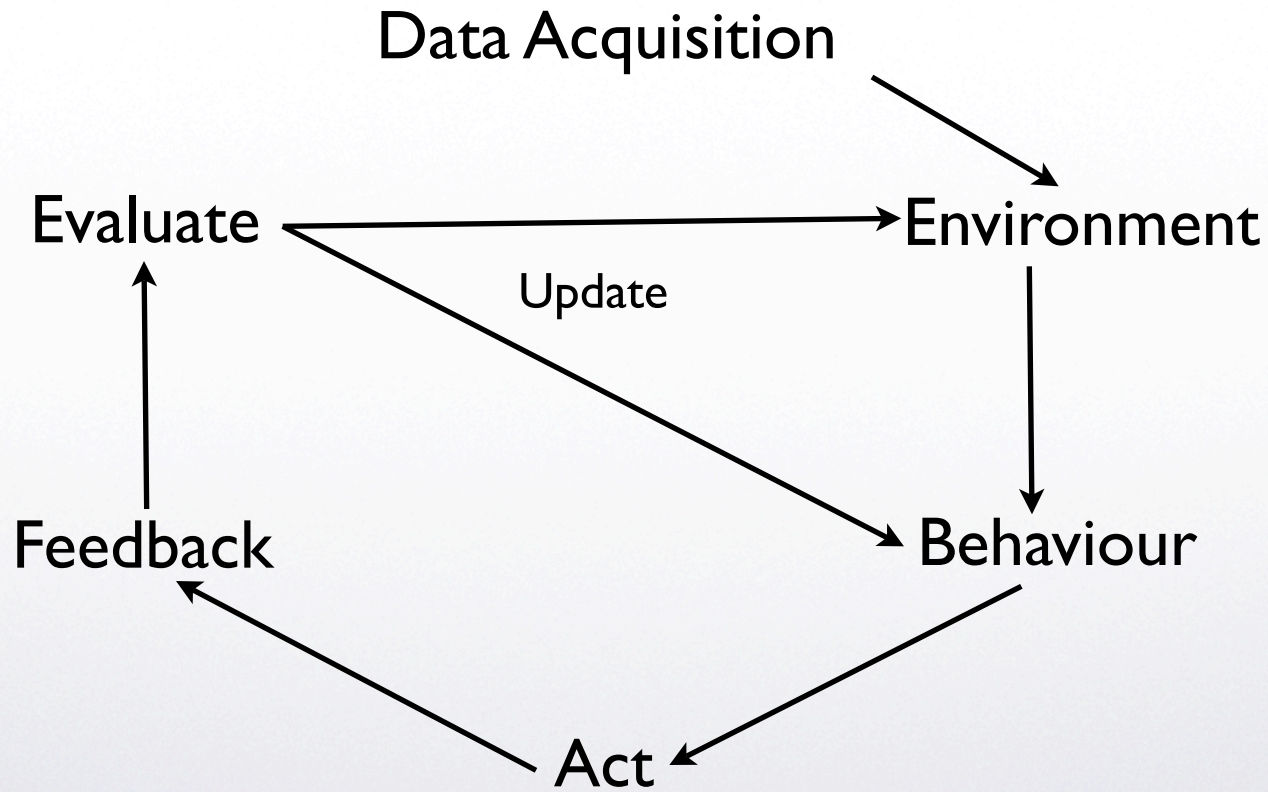
- Prune and filter input
- For that we use context

# Use Case

- **Bruce, a college lecturer:**
  - Working in office
  - Lunch
  - Meeting with student
  - Giving a lecture
- **Bruce has a lecture in an hour**
- Sends an email to his class regarding this lecture
- This lecture will be the last opportunity for the class to speak to him before exam time



# Scatterbox



# Context

- A context is a tuple containing a subject, predicate and object (s,p,o) that states a fact about the subject
- We define context as a measurable component of a given situation

<bruce, has\_location, lecture\_theatre>

<lecture, has\_time, 1100>



# Situations

- **Contexts are the atomic components of a situation**
  - Generally not useable as standalone pieces of data
- **We need a way of composing context into useable situations**
  - Monitor for changes in situations

# Situation Composition

⟨ bruce, is\_in, lecture\_theatre ⟩

⟨ bruce, diary\_entry, lecture ⟩

⟨ lecture\_theatre, num\_people, 20 ⟩

⟨ bruce\_comp, program\_open, keynote ⟩

⟨ bruce, posture, standing ⟩

⇒ **Bruce is giving a lecture**

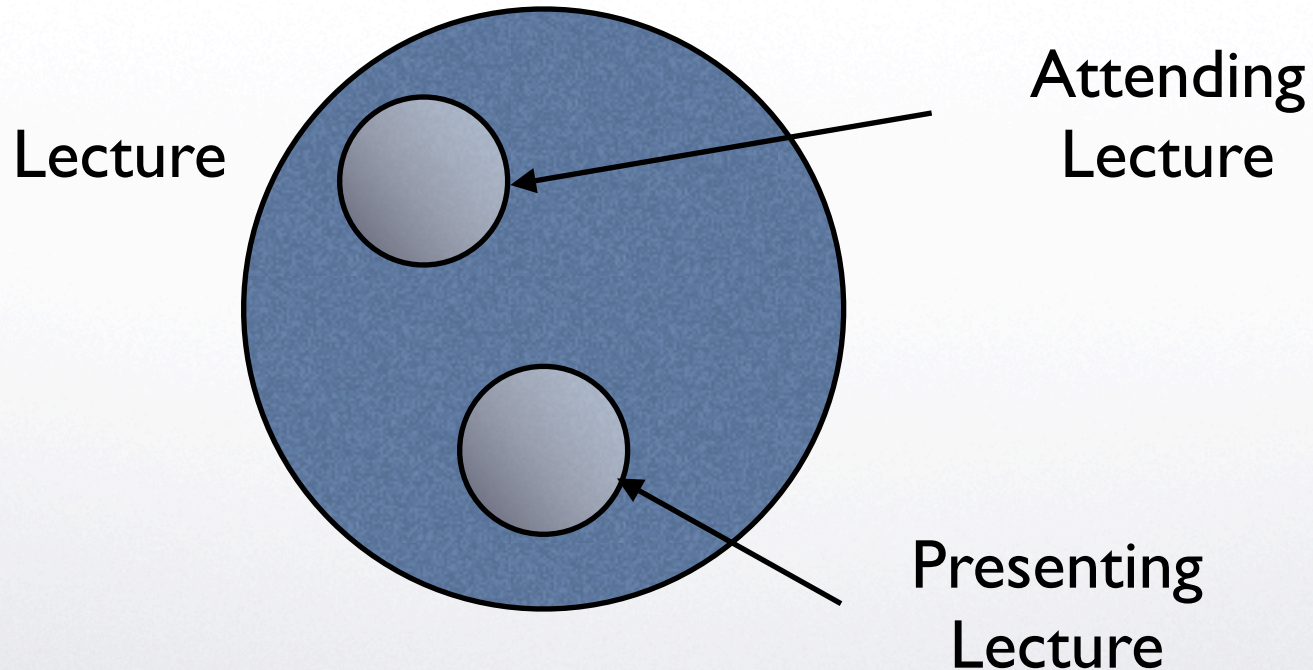


# Situation Spaces

- **Context = <subject, predicate, object>**
  - *Set of contexts A:  $\langle S_a, P_a, O_i \rangle$*
  - *Set of contexts B:  $\langle S_b, P_b, O_i \rangle$*
- **A situation space is the cartesian product of contexts:**
  - $AB = \{(a_1, b_1), (a_1, b_2), (a_2, b_1), (a_2, b_2)\}$
  - Where  $a_1, a_2 \in A$        $b_1, b_2 \in B$

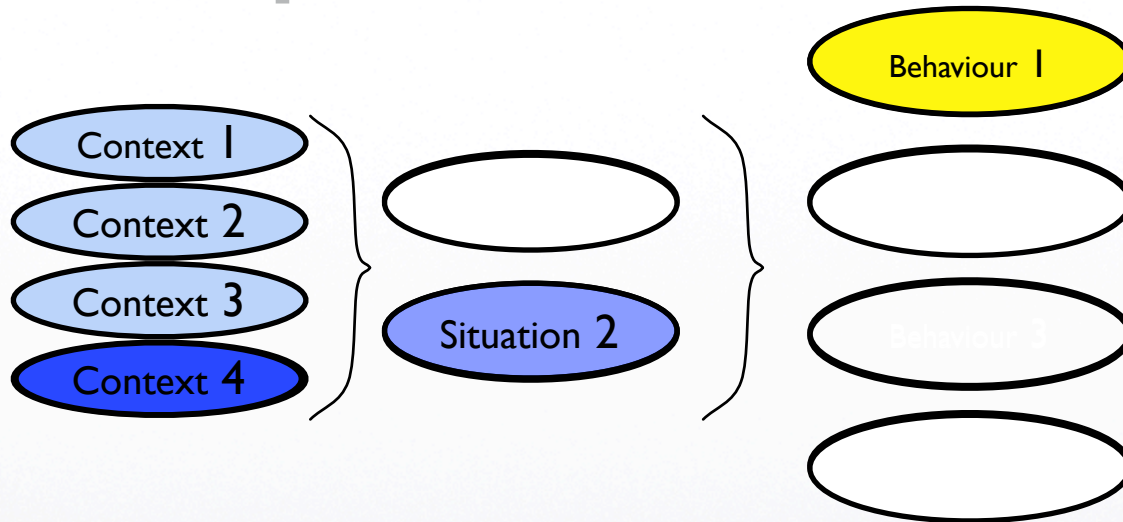
# Situation

- *A situation is a subset of a situation space*





# Adaptive Behaviour



- **Adaptation points**
  - Point at which the system's behaviour changes
    - Context variable changing value

# Gathering Data

- **Location**
  - Ubisense
  - Bluetooth
- **Calendar**
- **Email**
- **Computer Activity**
- **Data available throughout environment**
  - Distributed using Construct
- **Construct:**
  - Middleware which distributes data throughout a network
  - Each node has a local view of the global system.



# Scatterbox Design

- **Distributed Bluetooth Scanners**
  - Each has a precise location
    - Scans for specific BT devices
    - User's distance from this point is derived
    - Data distributed using Construct
- **Email monitor**
  - Constantly checks the user's inbox for new emails

# Scatterbox Design

- Reasoner
  - Identify user's situation
  - If *new email && situation is appropriate*
    - forward email
- Bluetooth Push protocol used to send relevant e-mails to user



# Evaluation

- **Bluetooth Push**
  - Users are asked whether they are willing to accept a message
    - Acceptance:
      - *Context correctly determined and correct action taken*
    - Rejection:
      - *Context incorrectly determined -- False positive*

# Evaluation

- **Feedback Loop**
  - System should continually learn from successes and failures
- **Questionnaire**
  - Allows users to give more detailed feedback
  - Way of determining false negatives



# Conclusion

- **Scatterbox**
  - Determines User's situation by composing numerous sources of contextual data
  - Emails, calendar Info, Location
- **Adaptation Points**
  - Boundary between two situations

# Future Work

- Deploy and evaluate
- Efficient means of situation composition
- Improve email filter
- Zero config



Questions?