Programming Deliberative Agents for Mobile Services: 3APL-M Platform

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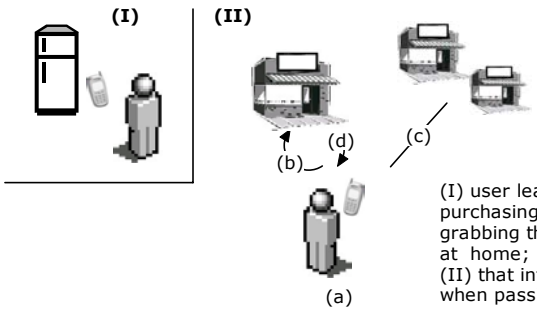
Intelligent Mobile Service

- Illustrative Example: M-Commerce



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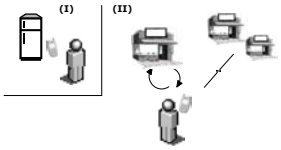
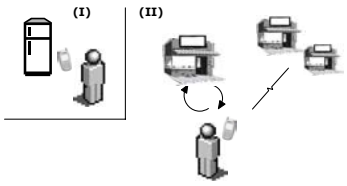
(II) that information will be most useful when passing by a food store.

Intelligent Mobile Service



- Requirements
  a) Detect Location: nearby store
  b) Pro-active behaviour: start quoting process once nearby store
  c) Represent Information: represent shopping list and know
  d) Coordination/Communication process: know how to request a quote from nearby store
  e) Interface to user: display received quote

Main issues



- Dynamic environment
- Pro-activeness
- Adaptiveness (self-tunning apps)
- Collaboration
- Constrained resources
  - Computing resources
  - Battery operated
  - Reduced interface
  - Connectivity issues

Agents for Mobile Services

- Agents-technology provides suitable features:
  - Situatedness: aware of the environmental conditions surrounding the mobile user
  - Openness: able to add/remove new modules
  - Local interaction: able to interact with elements environment and other components
  - Local Control: able to run autonomously

Question

- How to implement agents for mobile services?
- How to implement agents able to execute in mobile computing devices?

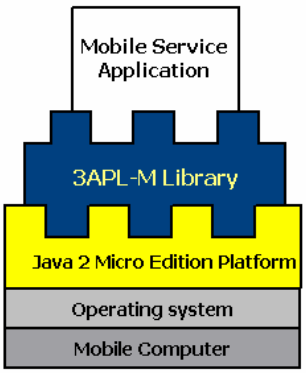
3APL-M Platform

What is 3APL-M?

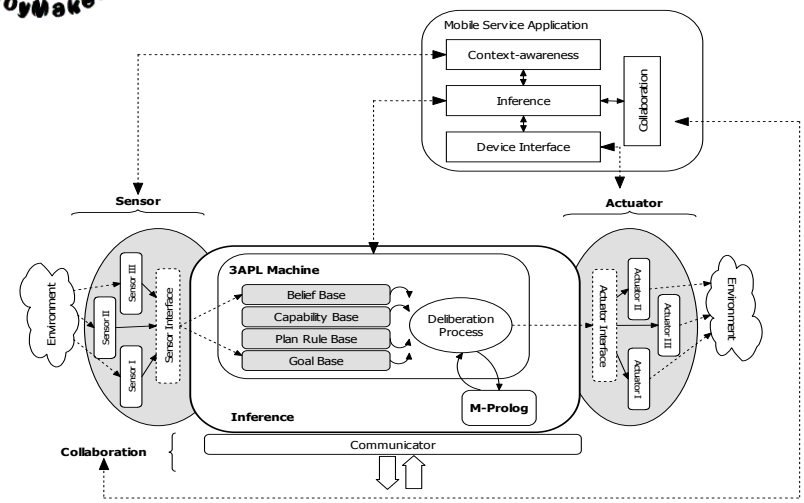
- 3APL Coded Agents
- Target: Mobile Computing applications

- Released versions:
  - Java 2 Micro Edition: phones, PDAs, …
  - PersonalJava: PDA
  - Java 2 Standard Edition: desktop computing

Where 3APL-M fits?

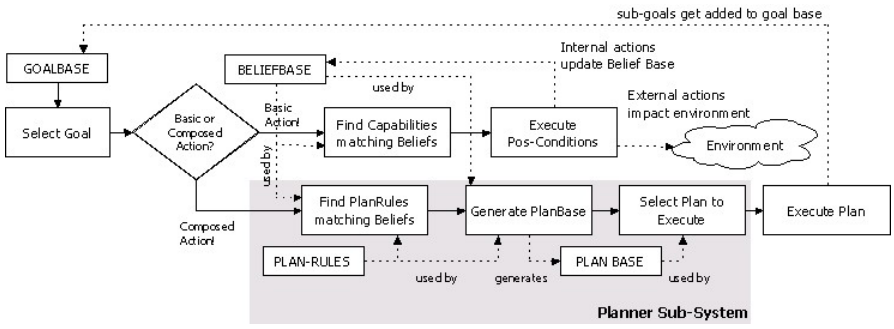


3APL-M Architecture



Implements 3APL Deliberation Cycle

- 3APL Engine



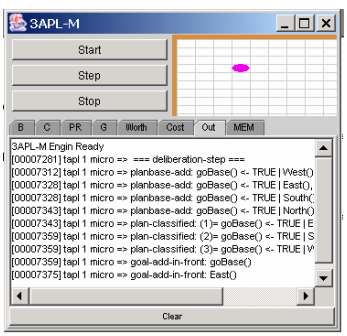
Features

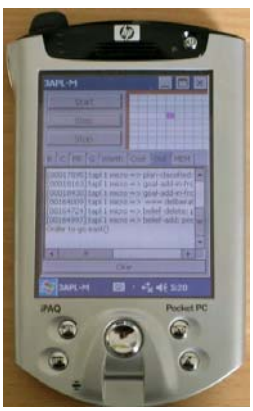
- Deliberative Agents
  - Re-use 3APL specifications
  - BDI-style programming
- Small enough
  - 512 Kb RAM, 20Mhz CPU
- Integrates to Java technology
  - Build Sensors and Actuators in Java
  - Runs on Java 2 Micro Edition Devices

Examples

Example: BlockWorld

- BlockWorld





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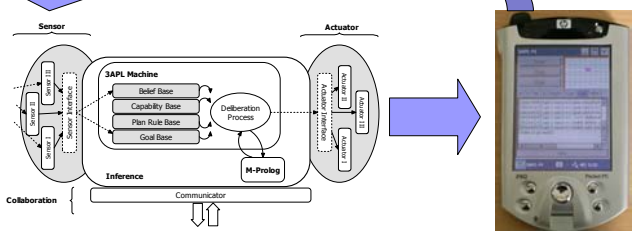
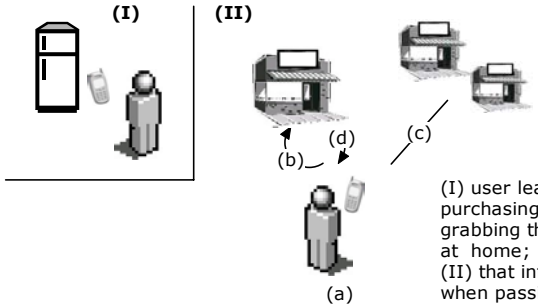


CAPABILITIES:
{pos(X, Y)} West() { NOT pos(X, Y), pos(X - 1, Y), BlockMove(west())}.
{pos(X, Y)} East() { NOT pos(X, Y), pos(X + 1, Y), BlockMove(east())}.
{pos(X, Y)} North() { NOT pos(X, Y), pos(X, Y + 1), BlockMove(north())}.
{pos(X, Y)} South() { NOT pos(X, Y), pos(X, Y - 1), BlockMove(south())}.
{} BlockMove(X) {EXTERNAL}.

RULEBASE:
goBase() <- pos(X, Y) AND base(X, Y) | SKIP().
goBase() <- pos(X, Y) AND base(A, B) AND X > A | West(), goBase().
goBase() <- pos(X, Y) AND base(A, B) AND X < A | East(), goBase().
goBase() <- pos(X, Y) AND base(A, B) AND Y > B | South(), goBase().
goBase() <- pos(X, Y) AND base(A, B) AND Y < B | North(), goBase().

Example: M-Commerce

- Mobile commerce



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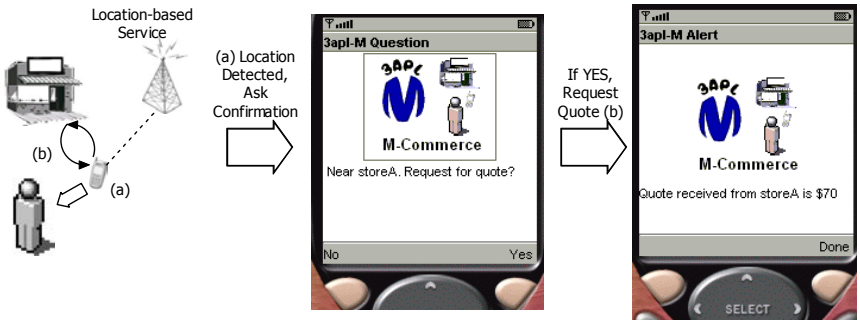

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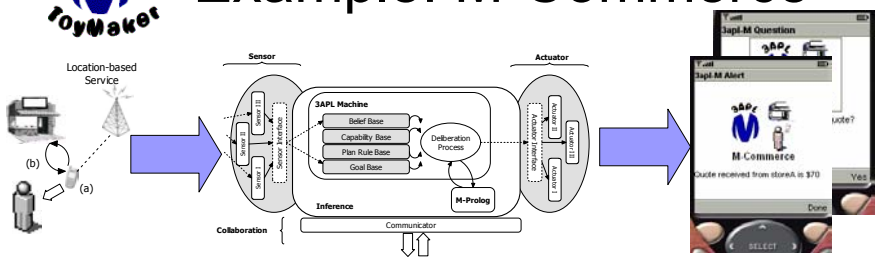


```
RULEBASE:
addItemToList(Item) <- TRUE |
        AddItemToList(Item).
displayQuote(Shopping, Quote) <- TRUE |
        Display([Quote received from , Shopping,  is $, Quote]).
getQuote(Shopping, List, Result) <- TRUE |
        Send(MsgId, Shopping, query-ref, quote(List)),
        Receive(MsgId, Shopping, Performative, Result, 4).
resolve <- location(near, Shopping) AND shoppingList(List) |
        AskConfirmation([Near , Shopping, . Request for quote?]),
        getQuote(Shopping, List, Result),
        Assert(receivedQuote(Shopping, List, Result)),
        displayQuote(Shopping, Result).
```

Conclusions

Conclusions

- It works! ☺
- Allows the implementation of 3APL-coded agents in mobile computing devices
- Small footprint: 512Kb RAM, 20Mhz CPU
- Integrate Java code: Sensors, Actuators

3APL-M Web Site

- http://www.cs.uu.nl/3apl-m