

Help Yourself : A Virtual Self-Assist System

Subhabrata Mukherjee[‡] and Sachindra Joshi[†]

[‡]Max-Planck-Institut für Informatik (Germany), [†]IBM Research Lab (India)

Introduction

- Contact center business represents a significant opportunity
 - Estimated \$600B business world wide
 - Highly labor intensive
 - \$300B will be spent in labor in 2014
- Self Assist Systems
 - Create systems that can solve customer problems in an automated manner
- Existing systems – simple transactional
 - What is my bill amount – using SMS
 - Book tickets from London to New York on April
 - Syntactically Rigid
 - Nothing exist for technical support
- Several knowledge management systems are in use in contact centers
 - Enable creation, search and deletion of knowledge articles
 - Used by agents to access the required information

Knowledge Article

Learn how to transfer contacts from a BlackBerry device to an iPhone

Last Updated: Nov 16, 2013

Back Up Contacts

If the contacts on the BlackBerry device are already synchronized to Google or to a Microsoft Exchange account they can be synchronized directly to the iPhone. You do not need to worry about exporting them from the BlackBerry device, ...

Export the On-device Contacts

1. Ensure you have installed BlackBerry Desktop software on the PC. The latest version can be found on BlackBerry ...
2. On the PC, open the BlackBerry Desktop Software application.
3. Connect the BlackBerry device to the PC via USB cable.
4. In BlackBerry Desktop Software, click Organizer from the menu on the left.
5. If a warning is displayed to Turn off wireless sync, follow these steps to turn it off on the device:
6. On the BlackBerry, in the Contacts application press the Menu key, then select Options.
7. If necessary, click the contact list.
8. Change the Wireless Synchronization field to No or clear Wireless Synchronization check box.
9. Press the Menu key, then select Save.
10. In BlackBerry Desktop Software, click Device, then Sync by Type, and Organizer.
11. Check the box to sync Address Book, and then click Microsoft Outlook Express.
18. Your contacts are now backed up to the Gmail or Exchange account.

Import Contacts

In the above steps you have backed up the BlackBerry device contacts to a Google or Exchange account. The following instructions guide you through the process of importing the contacts from these accounts to the iPhone.

Synchronize Contacts with Google or Exchange Account

1. On the iPhone tap Settings.
2. Tap Mail, Contacts, Calendars.
3. Tap Add Account ...

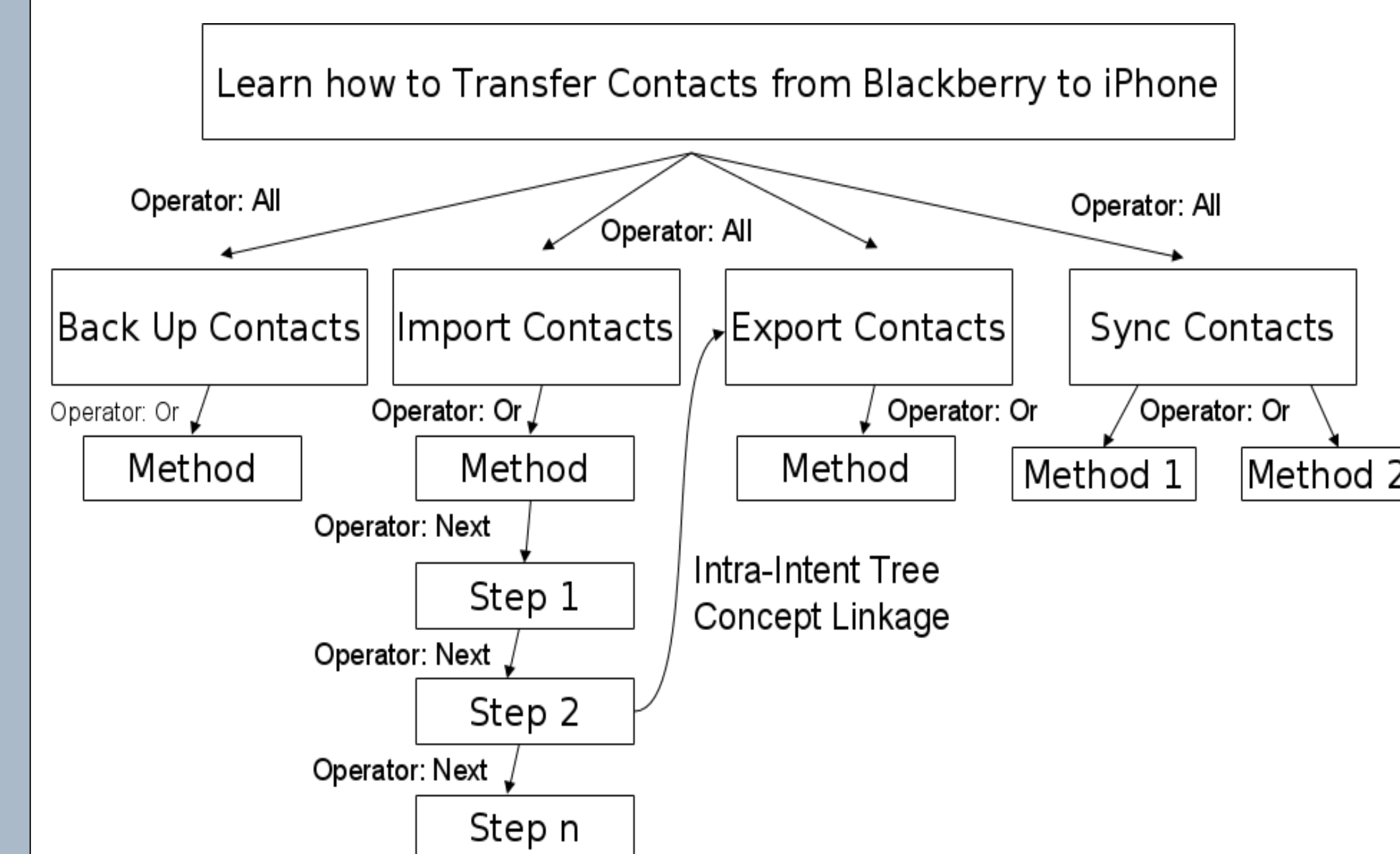
Intent Graph of Knowledge Article (XML)

```
<TitleIntent>
Learn how to Transfer Contact from Blackberry to iPhone
</TitleIntent>
<Intent: Operator <All>> Back Up Contacts
<Method>If the contacts on the BlackBerry device are already synchronized to Google
or to ... import them to a Google or Exchange account that will be set up to synch ...
</Method>
</Intent>
<Intent: Operator <All>> Export the On-device Contacts
<Method>
<Step: Operator <Next>> Ensure you have installed BlackBerry Desktop software on
the PC. The latest version can be found on the BlackBerry website.</Step>
<Step: Operator <Next>> On the PC, open BlackBerry Desktop application. </Step>
<Step: Operator <Next>> Connect the BlackBerry to the PC via USB cable. </Step>
.....
<Step: Operator <Next>> Now you can Import this .CSV file to Gmail / Outlook acc.
</Step>
<Step: Operator <Or>> For Gmail – click Settings > Import.</Step>
<Step: Operator <Or>> For Outlook – click File > Import and Export.</Step>
</Method>
</Intent>
<Intent: Operator <All>> Import Contact
<Method> In the above steps you have backed up the device contacts to a Google or
Exchange account.The following instructions guide you through...</Method>
</Intent>
</TitleIntent>
```

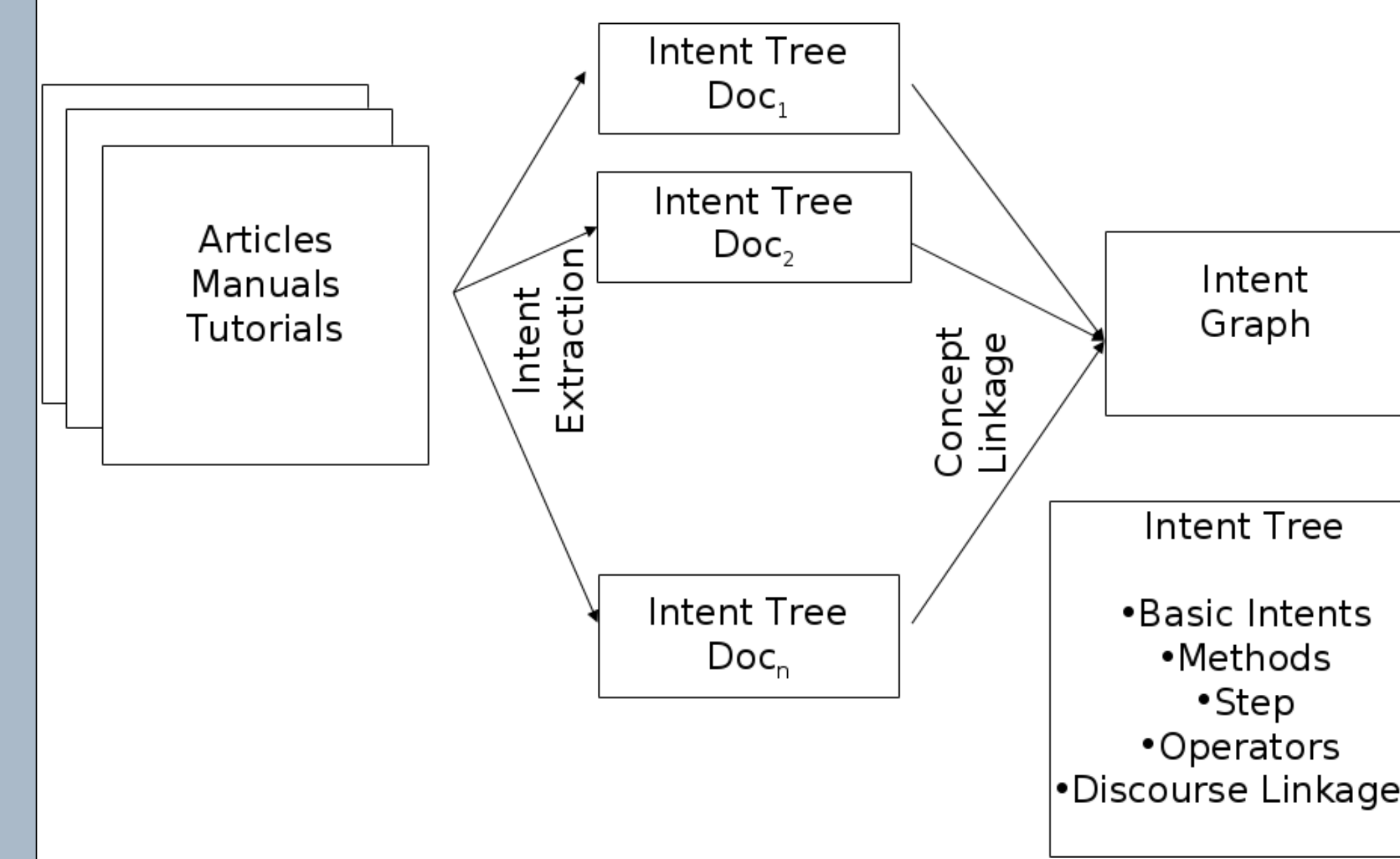
Intent Graph

- A document may have several topics or objectives of user interest
- Each such topic is defined as an **intent**
 - E.g. The doc. “Learn to transfer user contacts from Blackberry to iPhone” may have the intents: *import contacts, export contacts, back up contacts, synchronize contacts*
- Each intent may have multiple **methods** to satisfy the intent
 - E.g. The intent “*software upgradation*” has 2 possible methods: *Automatic and manual upgrad.*
- A method consists of a sequence of **steps**
 - E.g. method for the basic intent “export on-device contacts” has a sequence of 18 ordered steps
 - Each logical unit in any method is a step
 - Steps are connected by **operators**
- Steps for a method and methods for an intent may be connected by the following operators:
 - **All** - representing an unordered sequence of steps
 - **Or** - denoting that either of the steps may be performed on the method
 - **Next** - representing an ordered sequence of steps
- Intra-document **discourse linkages** are based on discourse markers (like *previous, before, following etc.*) to preserve sequence of information
 - E.g. steps to “import contacts” refer to “above steps” in the doc. to “export on-device contacts”
- A **basic intent tree** for an article consists of basic intents, methods, steps and operators
- Logical intra-tree linkage corr. to discourse linkage
- Multiple basic intent trees across diff. articles form an **intent graph**, where basic intents (or methods) are connected by co-referent **concept linkages**.

Intent Graph of Knowledge Article



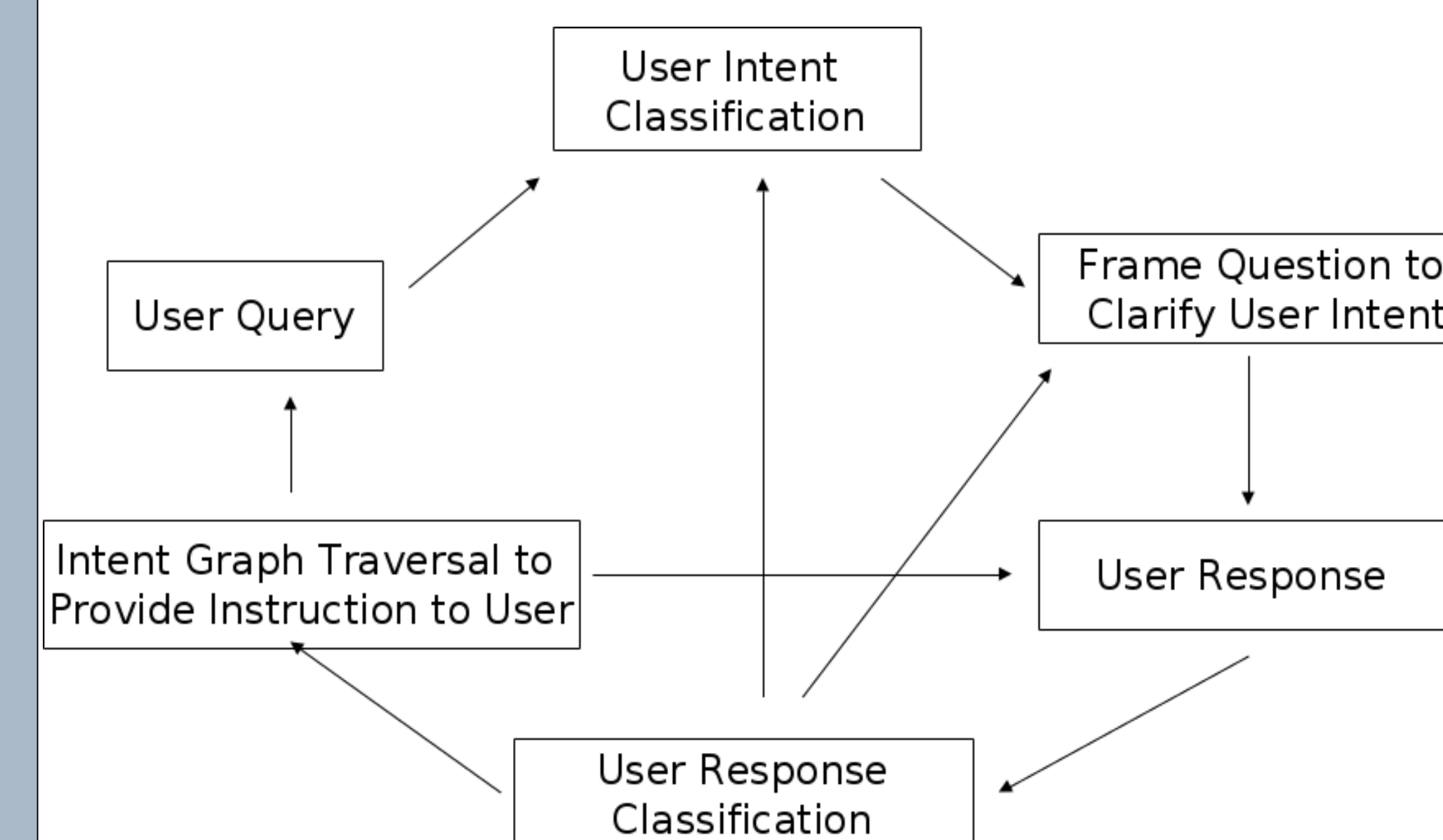
Intent Graph Extraction



Features for Intent Graph Extraction

- **Discourse Coherence**
 - Sentences connected by **co-ordinating conjunctions** like *as, follows etc.*, **sub-ordinating conjunctions** like *above, before etc.*, **adjectives** like *next, previous etc.* and **adverbs** like *following, furthermore etc.* are considered part of the same intent section
- **Paragraph and Section Break**
 - Indicate discontinuity in current intent section
- **Document Stylistic Markers**
 - *Font and header sizes, bold and strong font patterns etc.* are used to identify basic intents
- **Context Change**
 - Detected by domain keyword overlap
- **Lexical Chain**
 - Sequence of related words in the text, spanning short or long distances
 - Independent of the grammatical structure and captures the cohesive structure of the text
 - A basic intent segment contains domain keywords part of the same lexical chain

Self-Assist Dialogue System Block Diag.



Dialogue System Modules

➢ User Intent Classification

- Matches user query to a basic intent in the intent graph
- Tf-idf scores and dependency relations of the lemmatized keywords are used to retrieve top K intents matching the user query

➢ Question Generation

- In case of ambiguity or clarification (E.g. multiple intent matches), this module asks questions using Part-of-Speech tag pattern of the phrase with rules like :
 - Basic intent starting with a verb is prefix-ed with “Do you want to” (E.g. the intent `Learn to transfer ...' is framed into `Do you want to learn to transfer ...') etc.

➢ Response Classification

- The system monitors the user response which can be classified as:
 - **Continue** indicating the user is following the instructions
 - **Issue** detecting the user is facing difficulty with an instruction and *extracts* the cause
 - Frames question to *validate* the extracted issue and searches intent graph for *resolution*
 - Falls back on *search engine* if not in graph
 - **Switch** indicating a context switch in user query detected by keyword overlap between system and user response, response type from user etc.
 - **Abort** detecting the user is angry or frustrated (probably due to punts from the system)
 - A *dependency-parsing based feature-specific sentiment analysis* algorithm is used to find the polarity of user response about each domain keyword in the sentence

➢ Intent Graph Traversal

- System maintains intent graph in memory and stores graph and user response states in stack
- It matches user query to a basic intent in graph and extracts methods for the intent from graph
- In case of ambiguity it frames a question
- It displays steps (methods) for method (intent) according to the operator connecting them
- After each instruction, the system waits for user response to monitor progress.
- It follows *intra-tree discourse linkages* and *inter-tree concept linkages* to display methods and steps according to user query