

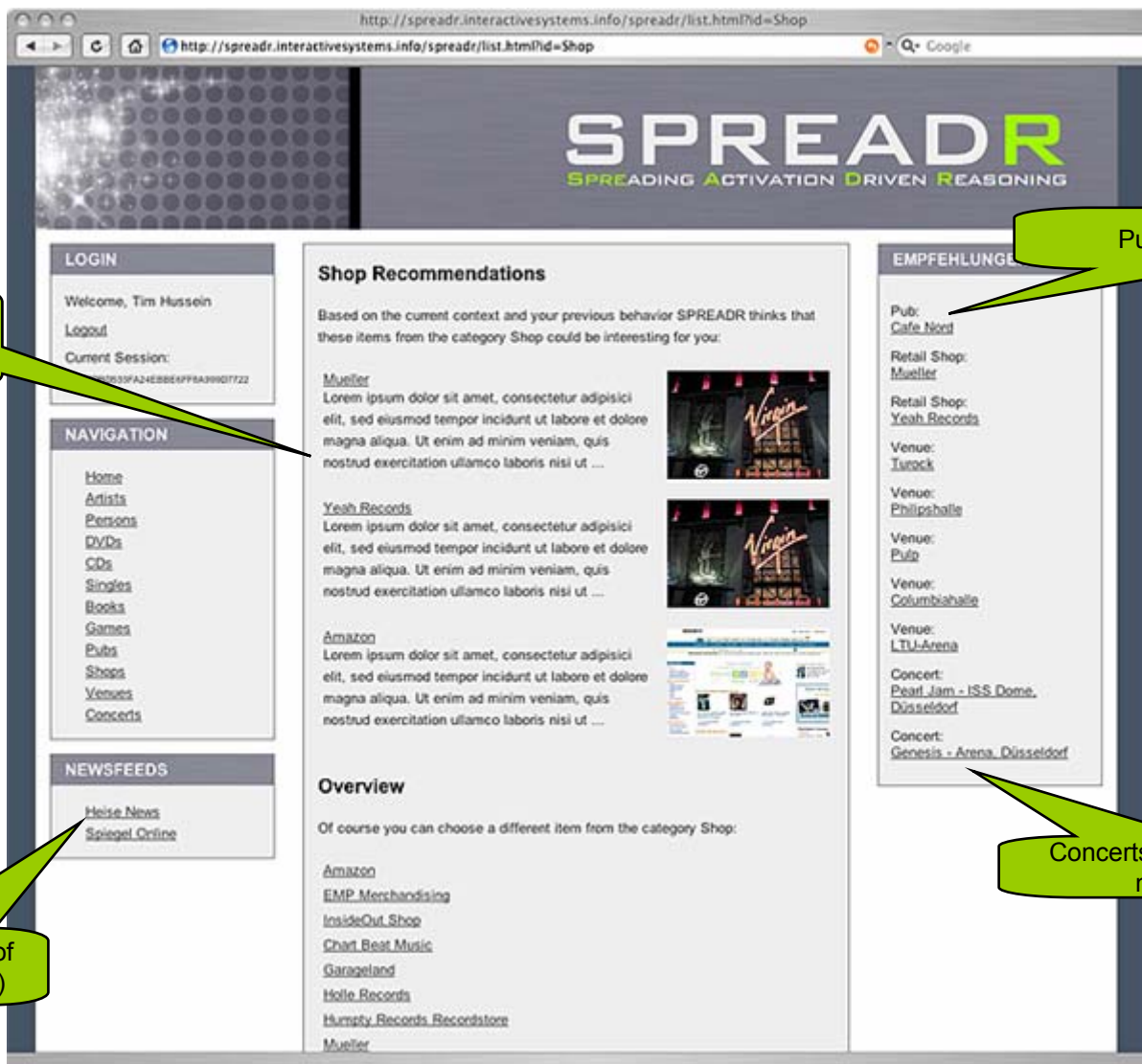
Context-adaptation based on Ontologies and Spreading Activation



ABIS 2007, Halle, 24.09.07

Tim Hussein, Daniel Westheide and Jürgen Ziegler
{hussein,westheide,ziegler}@interactivesystems.info

Context Adaptation in Spreadr



Most relevant items inside this category

Pubs near my location

Adaptive integration of newsfeeds (planned)

Concerts related to my interests near my location

Idea behind Spreadr

- **Model based approach:**
 - A domain ontology is used to store structural information about the domain items
 - Items semantically linked to each other
- Each item has a certain **activation value** from [0...1]
- Categories and items with higher activation values are **more important**
- **Spreading Activation** is used to modify the activation values

Technical Background

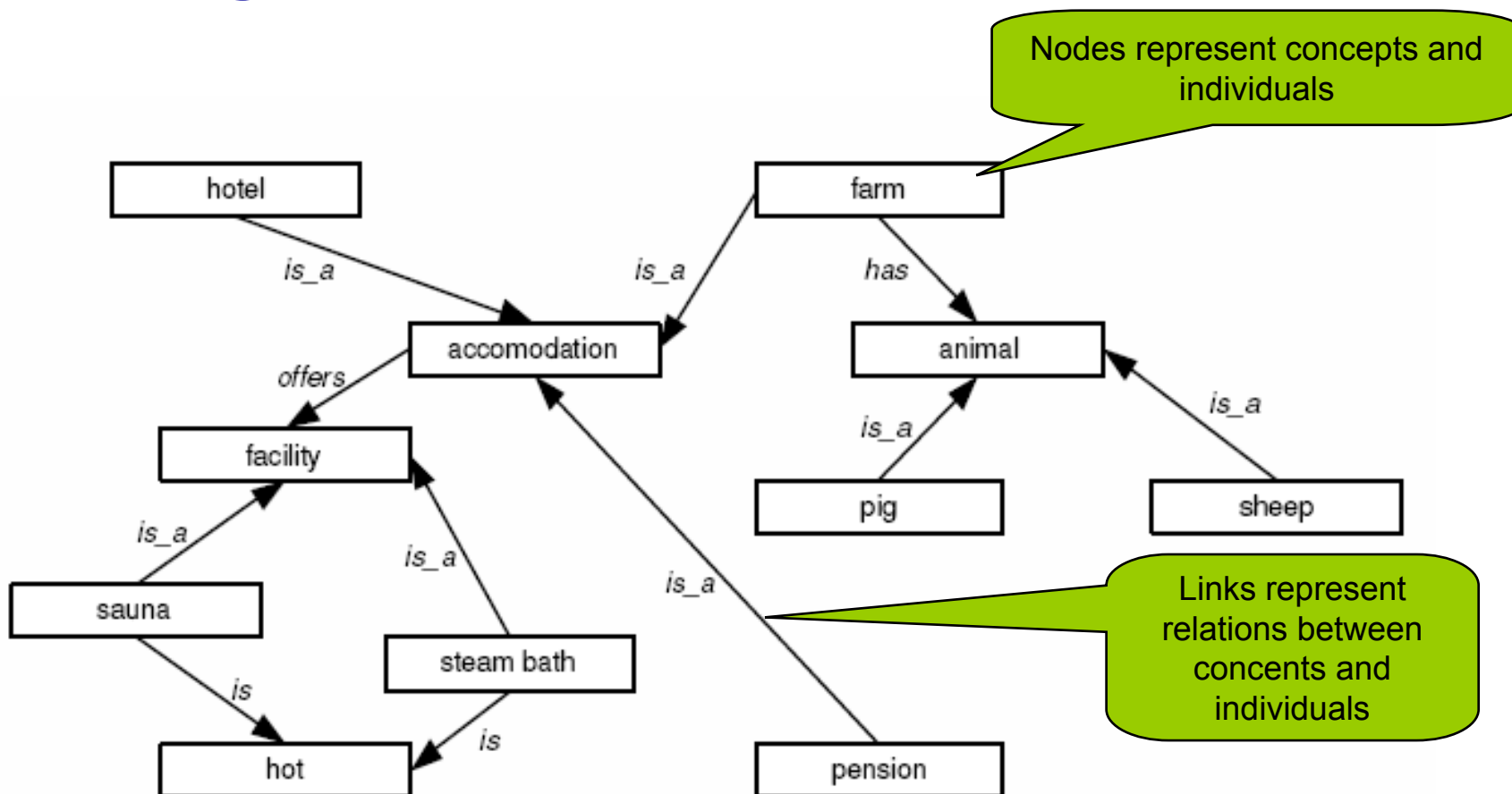
- **Spring Framework**
 - Flexible Java-Framework for (Web-)Applicationen

- **JSP and Struts Tiles** for the view-components

- **OWL** (Web Ontology Language) for the specific models (domain.owl, time.owl,...)

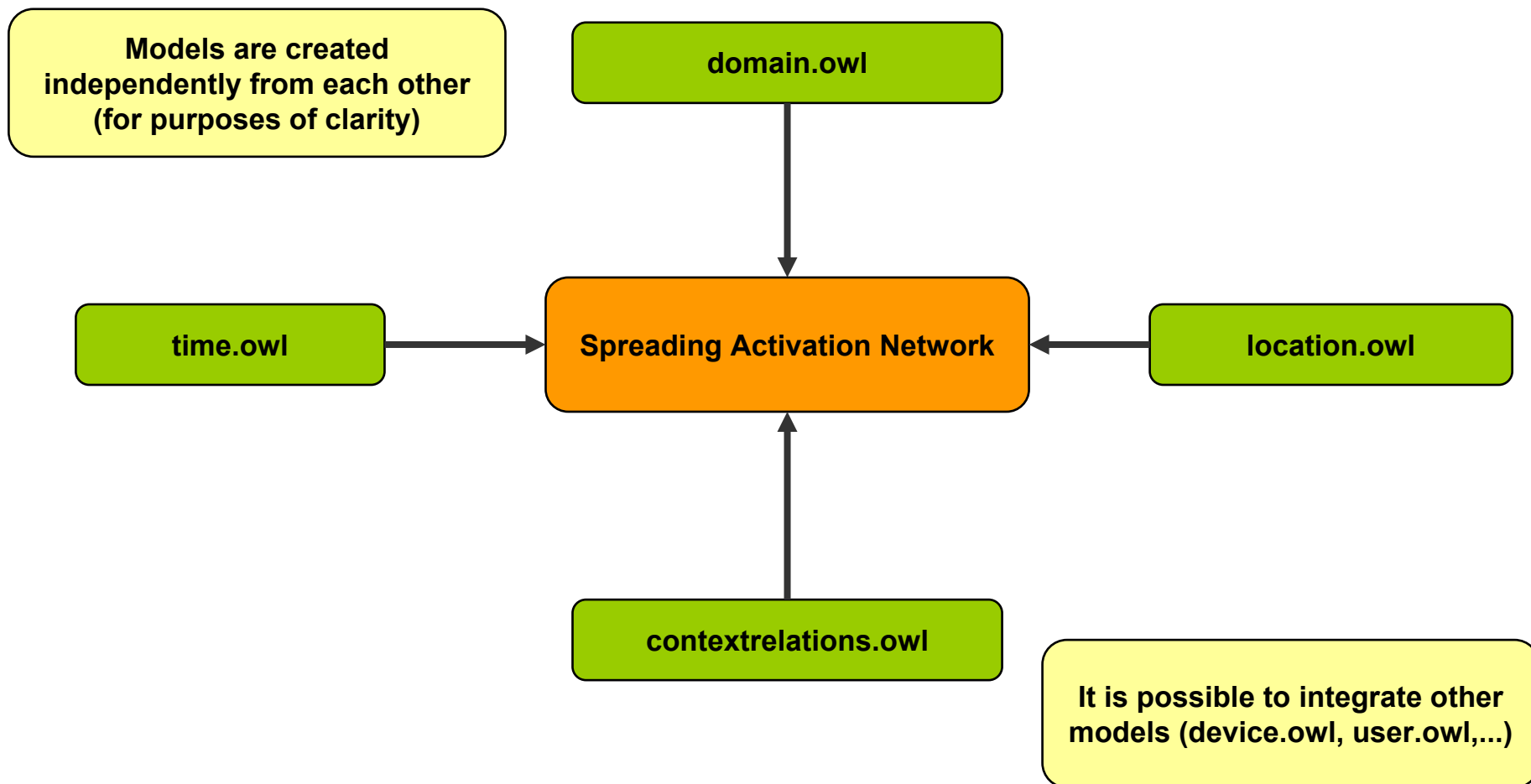
- **JENA**
 - Java framework for building Semantic Web applications based on RDF, OWL,...

Ontologies

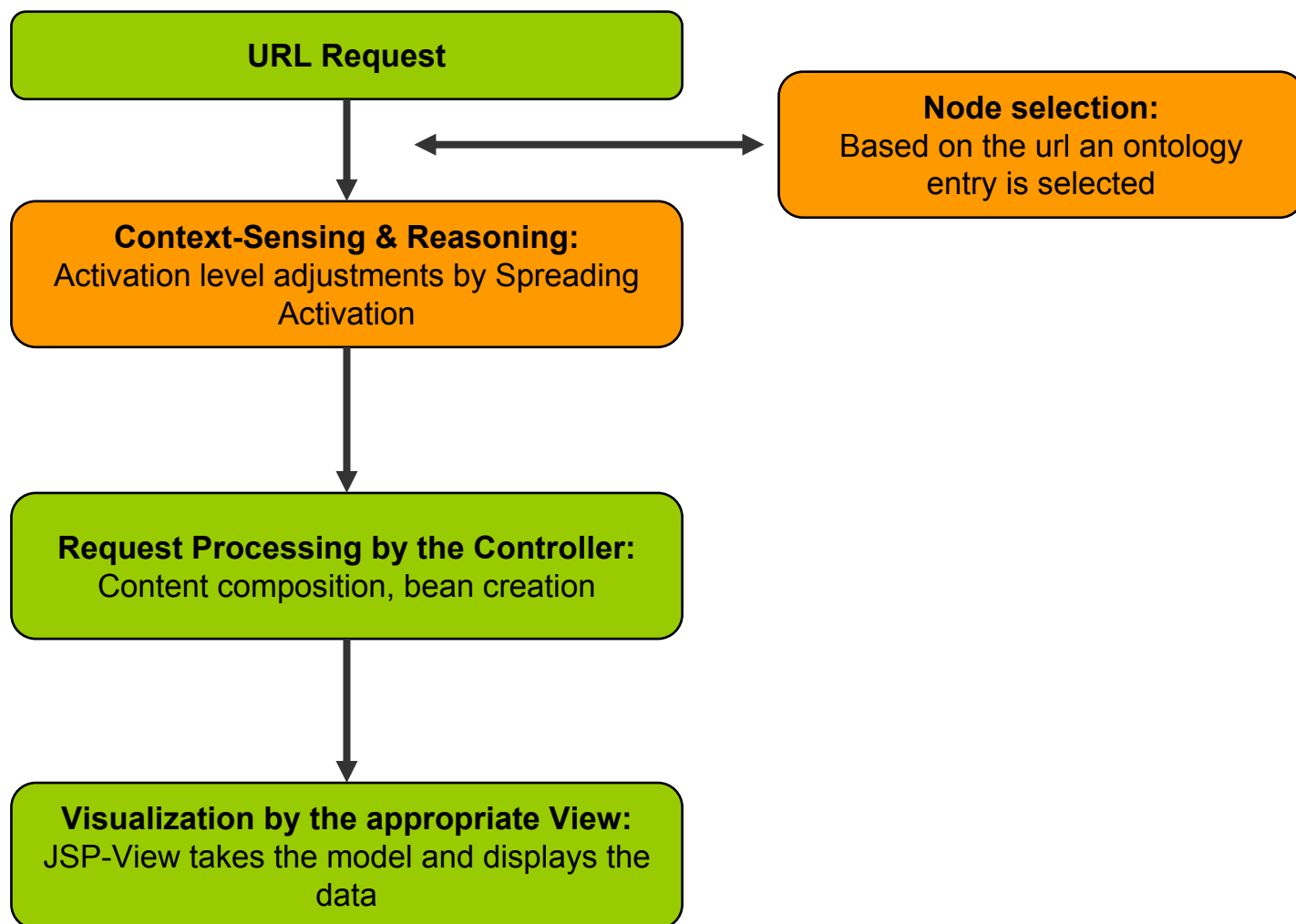


Basic idea behind Spreading Activation: If one node is being selected, activate it and spread the activation within the network so that semantically related nodes are also activated.

Model aggregation



Response generation in SPREADR

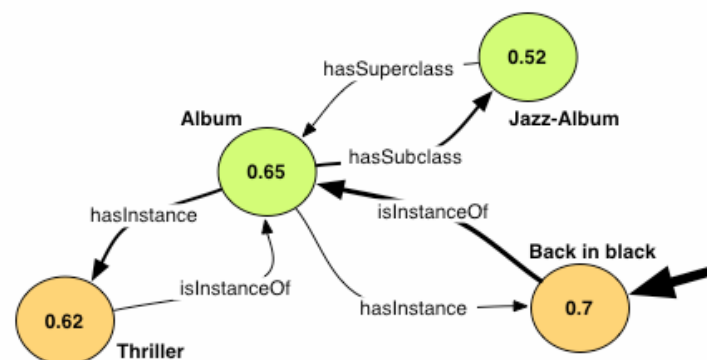
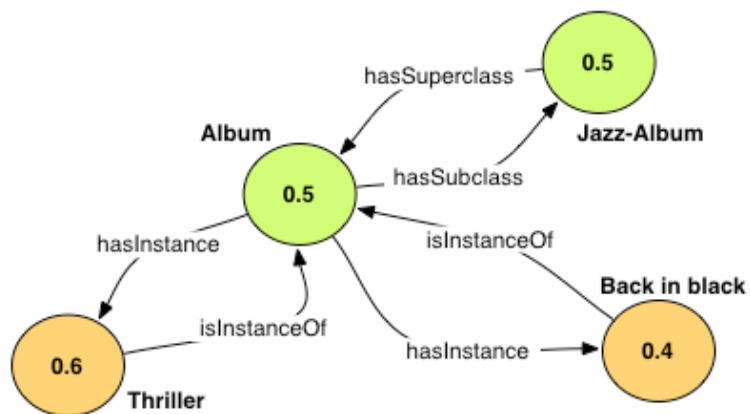


Context sensing

- **Context factors** are being recognized, e.g.:
 - The current **location** (location context)
 - The current **time** (time context)
 - The current **item** that has been selected (domain context)
- The appropriate **nodes are activated** in the Spreading Activation Network.
- These nodes are now activated with a certain value and spread their activation to semantically related nodes.

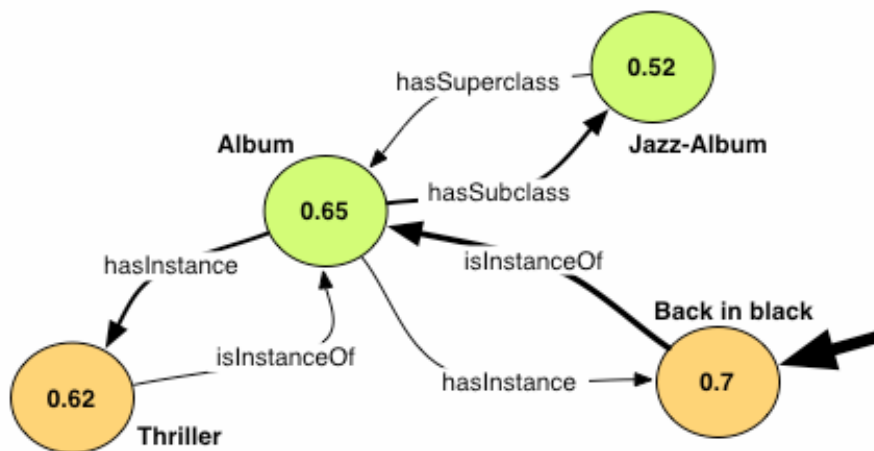
Spread of activation (1)

- After activating initial nodes their activation is being spread withing the network



Spread of activation (2)

1. Put the initial nodes into a processing queue
 - i. Take the node with the highest activation gain
 - ii. Spread the activation (attenuated) to all neighbors
 - iii. Mark the node as „processed“
 - iv. Put new activated nodes into the queue (if not already „processed“)
 - v. Check terminating condition
 - vi. Go to i.



Constraints and Termination Conditions

- The **Spreading Activation** can be **constrained** by:
 - **Distance:** Don't activate nodes that are too far away from the initial nodes.
 - **Fan-Out:** Don't process nodes with more than k relations (too less specific nodes).
 - **Type:** Only spread through certain types of nodes and relations.
 - **Activation:** Only spread activation when it is above a certain threshold.

- The **Spreading Activation** will be **terminated** when:
 - The processing queue is empty
 - A predefined time limit has exceeded
 - A predefined number of processed nodes has exceeded

Spreading Activation in SPREADR

- Creation and manipulation of individualized user profiles as a foundation for the adaptation effects
- When a fresh session starts a SpreadAc network is being created from the ontologies
 - All SpreadAc networks are **identical in structure**
 - **Activation levels** (of the nodes) and **weights** (of the edges) individualize the SpreadAc networks
- Ranking and selection of concepts and individuals is based on activation level.

Learning in SPREADR

- Each relation has a certain **weight**.
- A high weight means that a relation is very **important**.
- The **higher** the relation weight, the **more activation** is transferred via that relation.
- If a recommendation is **accepted** by the user (by clicking on that item) **the paths that transported activation** to that node in the recent time are **amplified**.
- If a recommendation is ignored the paths are slightly **attenuated**.

Thank you for your attention

The screenshot shows a web browser window displaying the SPREADR website. The URL is <http://spreadr.interactivesystems.info/spreadr/list.html?id=Shop>. The page features a dark header with the SPREADR logo and the tagline "SPREADING ACTIVATION DRIVEN REASONING".

LOGIN

Welcome, Tim Hussein
 Logout
 Current Session:
 371F7D0653FA24E8BE6FF8A9907722

NAVIGATION

- Home
- Artists
- Perions
- DVDs
- CDs
- Singles
- Books
- Games
- Pubs
- Shops
- Venues
- Concerts

NEWSFEEDS

- Heise News
- Spiegel Online

Shop Recommendations

Based on the current context and your previous behavior SPREADR thinks that these items from the category Shop could be interesting for you:

Mueller
 Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut ...

Yeah Records
 Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut ...

Amazon
 Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut ...

Overview

Of course you can choose a different item from the category Shop:

- Amazon
- EMP_Merchandising
- InsideOut_Shop
- Chart_Best_Music
- GarageLand
- Holle_Records
- Humpty_Records_Recordstore
- Mueller

EMPFEHLUNGEN

Pub:
Cafe Noct

Retail Shop:
Mueller

Retail Shop:
Yeah Records

Venue:
Turock

Venue:
Philipshalle

Venue:
Pulp

Venue:
Columbiahalle

Venue:
LTU-Arena

Concert:
Pearl Jam - ISS Dome, Düsseldorf

Concert:
Genesis - Arena, Düsseldorf