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Influence Power Factor for User Interface Recommendation System

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HR EXCELLENCE IN RESEARCH

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Agenda

Motivation

Problem formalization
- Interface definition
- Influence power idea
- Components features
- Component influence factor
- Data structure
- Recommender System
- Influence power evaluation

Conclusions

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Motivation

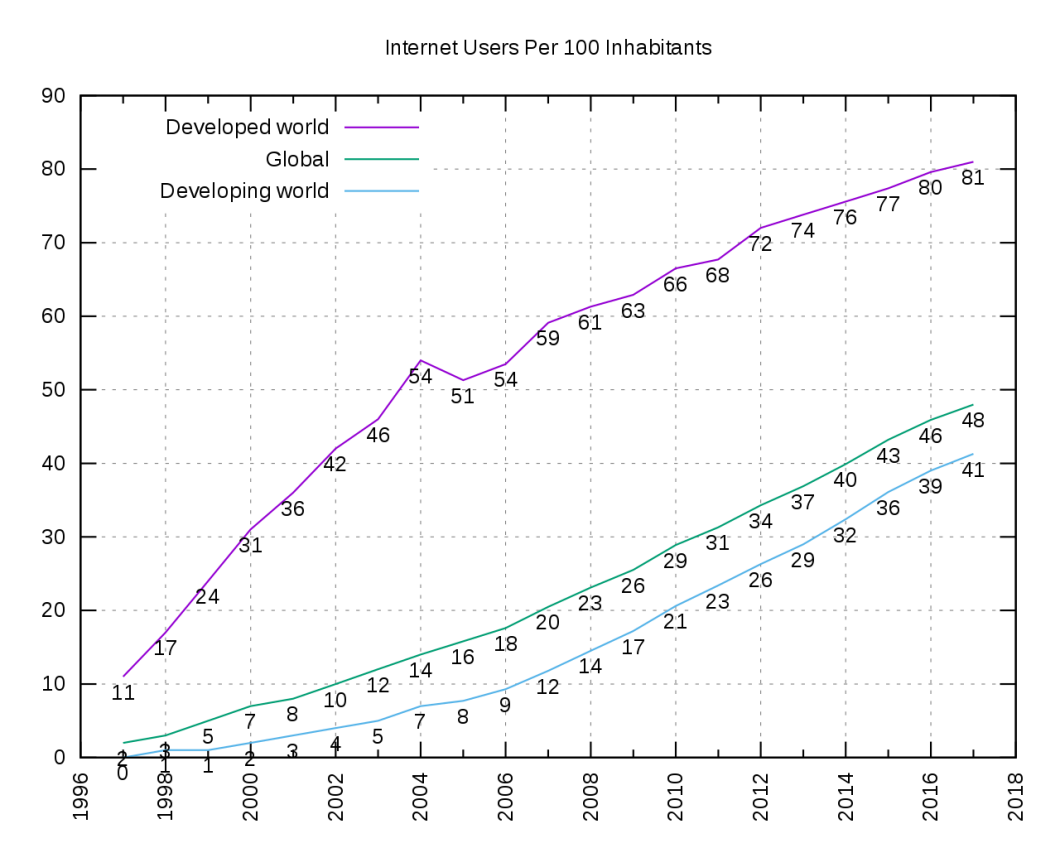

Figure: Graph of "Internet users per 100 inhabitants 1997 to 2017", years on the x axis, number of users on the y axis, according to the International Telecommunication Union (ITU)

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Motivation

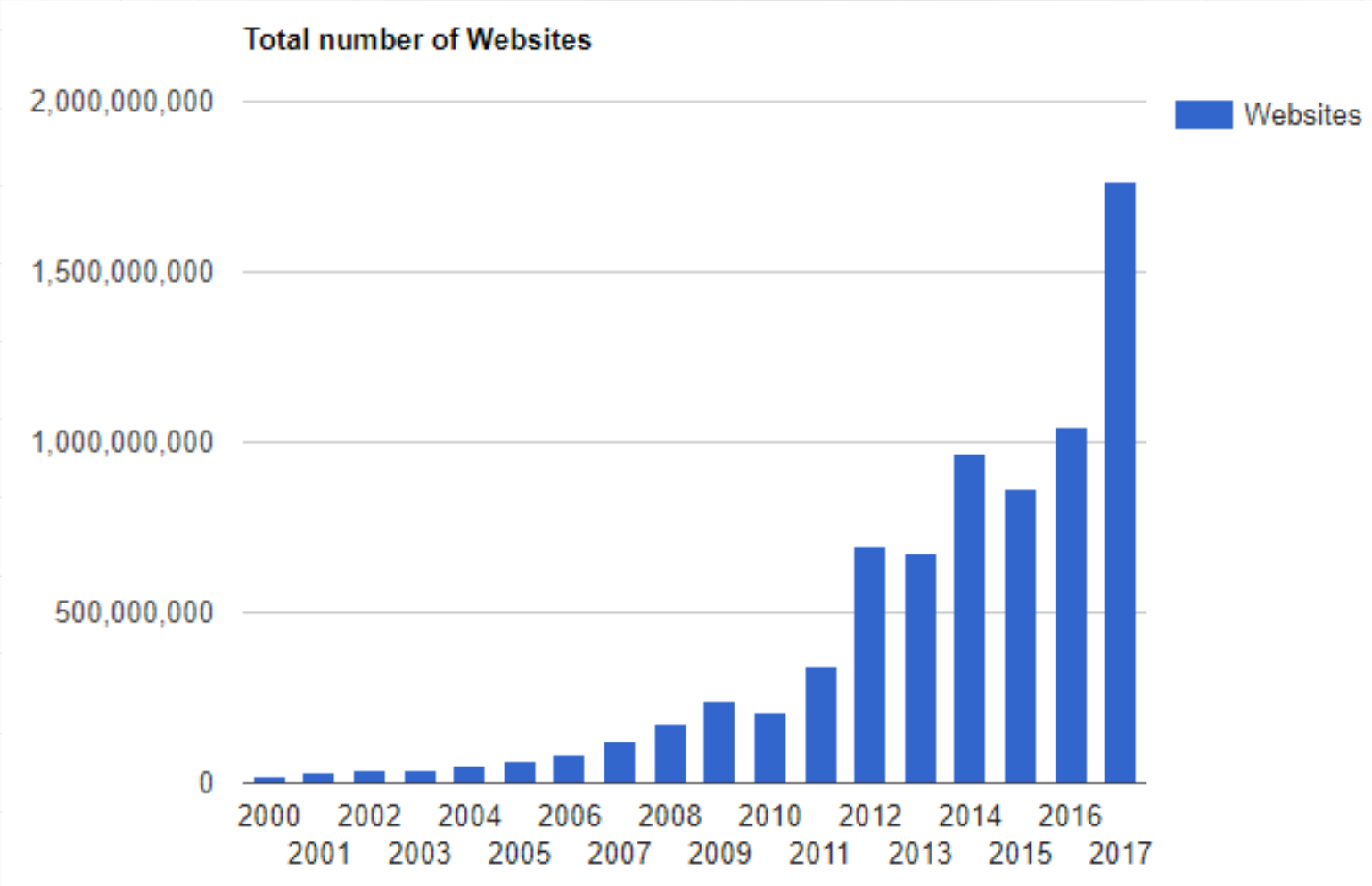

Figure: Graph of "Registered Web Sites, according to http://www.internetlivestats.com

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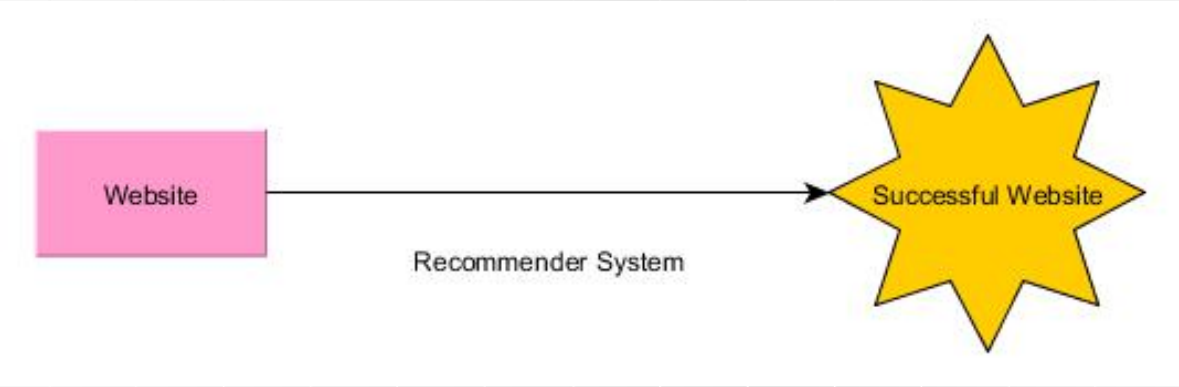
Motivation



- Recommender system
- Appropriate content
- User interface structure
- Ranking and reordering
- Knowledge about users and their preferences

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Problem formalization

Following formalism is used to identify heterogeneous structures:

- $\{e\} = \{e_1, \ldots, e_n\}$ – set of e elements (not changeable, sequence is irrelevant),
- $(e) = (e_1, \ldots, e_n)$ – tuple of e elements (not changeable, sequence is relevant),
- $\langle e \rangle = \langle e_1, \ldots, e_n \rangle$ – list of e elements (changeable, sequence is relevant).

Problem formalization

Interface definition

Interface I is defined as

$$I = \{s\} = \{s_1, \ldots, s_n\} \tag{1}$$

where each state s is defined as tuple built from set of components C and a template t.

$$s = (C, t) \tag{2}$$

where

$$C = \{c\} = \langle c_1, \ldots, c_n \rangle \tag{3}$$

and

$$t = \langle r \rangle. \tag{4}$$

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Problem formalization

Influence power idea

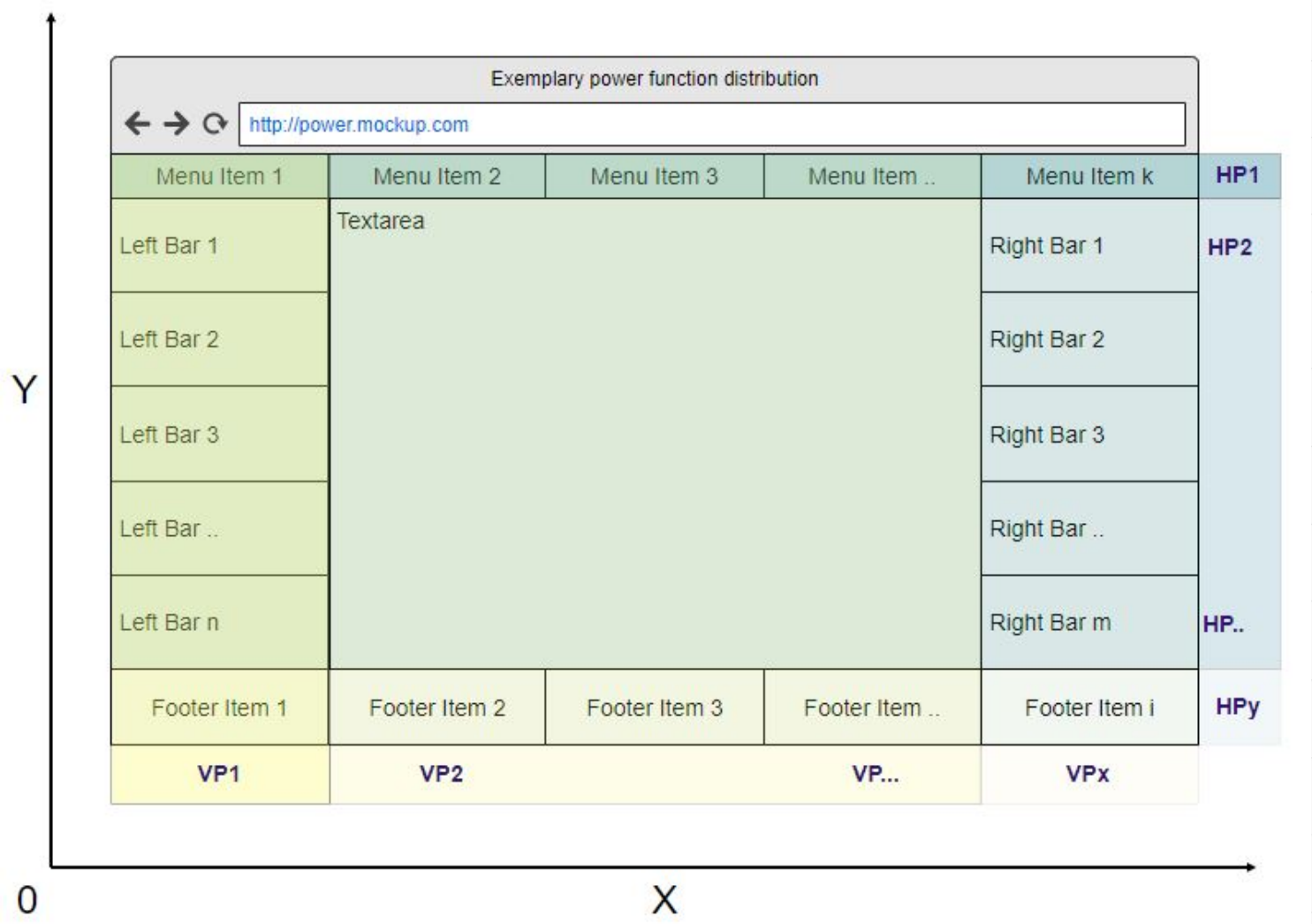

Figure: Diagram of the idealized user interface

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Problem formalization

Influence power idea

Figure: Simplified physical adjustment affecting Influence Power

Problem formalization

Components features

The component c is built from reference to region r, applied design characteristics d and a link l:

$$c = (r, d, l) \tag{5}$$

where

$$d = (P, a_a, a_m) \tag{6}$$

- P is a list of properties,
- a_a is additive influence power adjustment factor,
- a_m multiplicative influence power adjustment factor.

Problem formalization

Components features

The set of properties is defined as:

$$P = \{p\} = \langle p_1, \ldots, p_n \rangle \tag{7}$$

where each property is a tuple of feature list F and value list V:

$$p = (F, V) \tag{8}$$

where:

$$F = \langle f_1, \ldots, f_n \rangle \tag{9}$$

$$V = \langle v \rangle = \langle v_1, \ldots, v_n \rangle. \tag{10}$$

Problem formalization

Component influence factor

The proposed factor is built according to following formula:

$$cip = pip + dip \tag{11}$$

where:

cip – component influence power,

pip – position influence power,

dip – design characteristic influence power.

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Problem formalization

Data structure

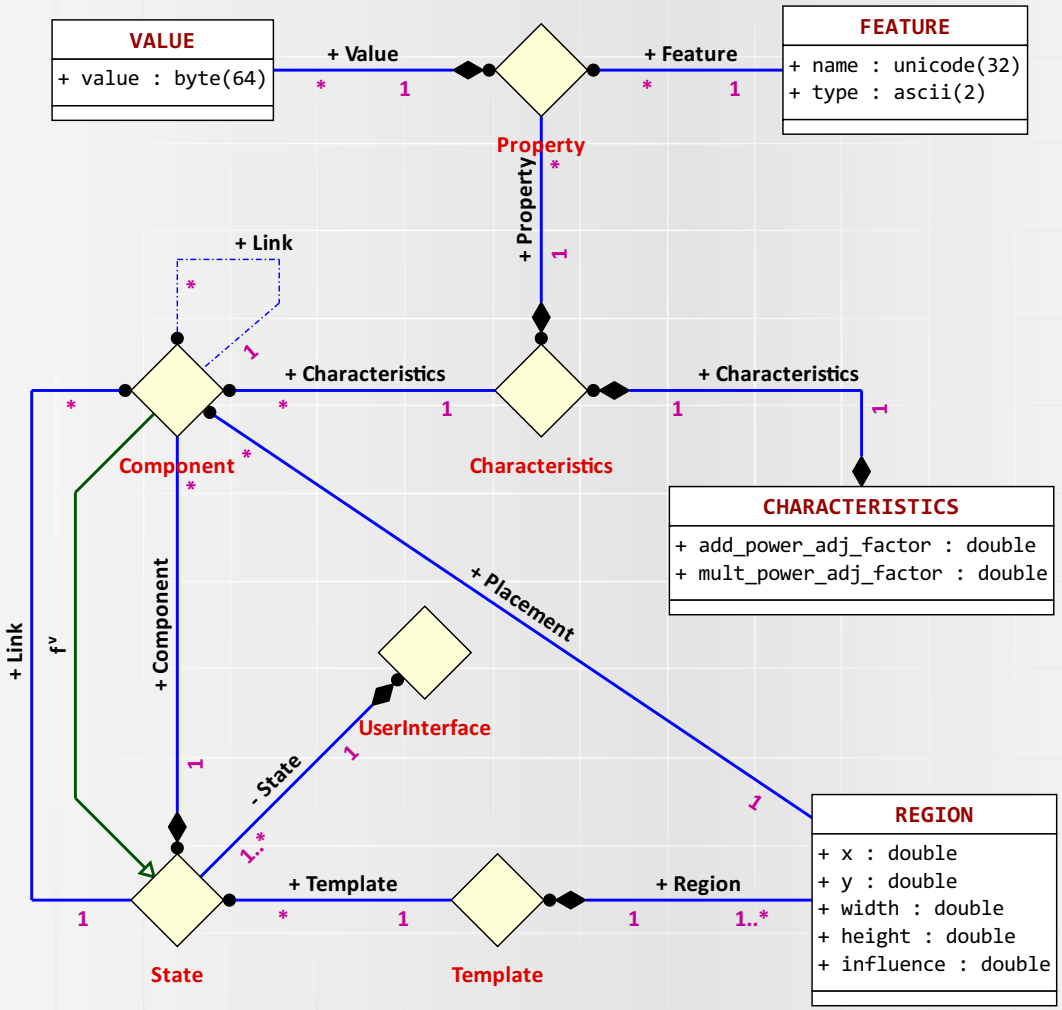

Figure: Database structure for data retrieval system expressed in AML

Problem formalization

Influence power evaluation

$$L = [l_{ij}] \tag{12}$$

where each l_{ij} is computed according to following equation

$$l_{ij} = (c_s, c_e, cip) \tag{13}$$

where:

- c_s – start component in the link,
- c_e – end component in the link,
- cip – computed influence power.

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Problem formalization

Influence power evaluation

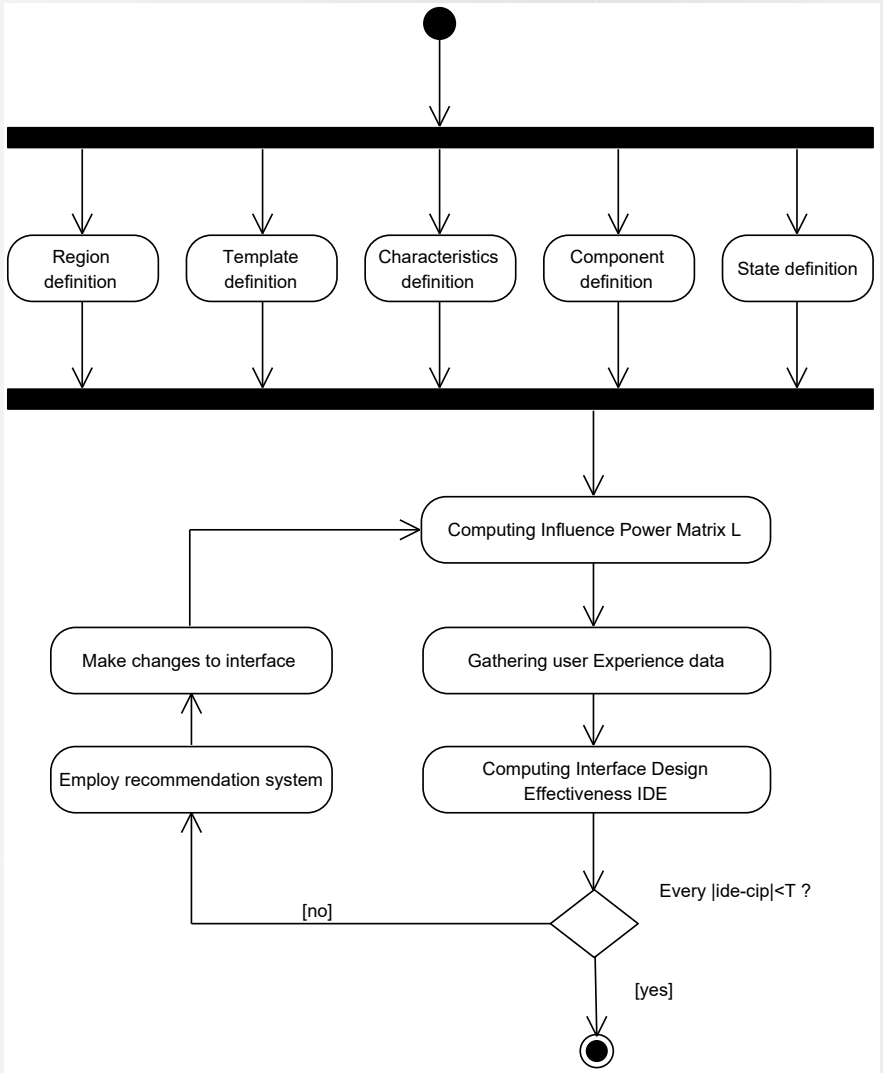

Figure: Algorithm for user interface effectiveness assessment

Problem formalization

Influence power evaluation

Interface Design Effectiveness – *IDE* matrix for each of states as:

$$IDE = [ide_{ij}] \tag{14}$$

where each ide_{ij} is computed according to following equation

$$ide_{ij} = (c_s, c_e, uu) \tag{15}$$

where:

- c_s – start component in the link,
- c_e – end component in the link,
- uu – user usage.

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Problem formalization

Influence power evaluation

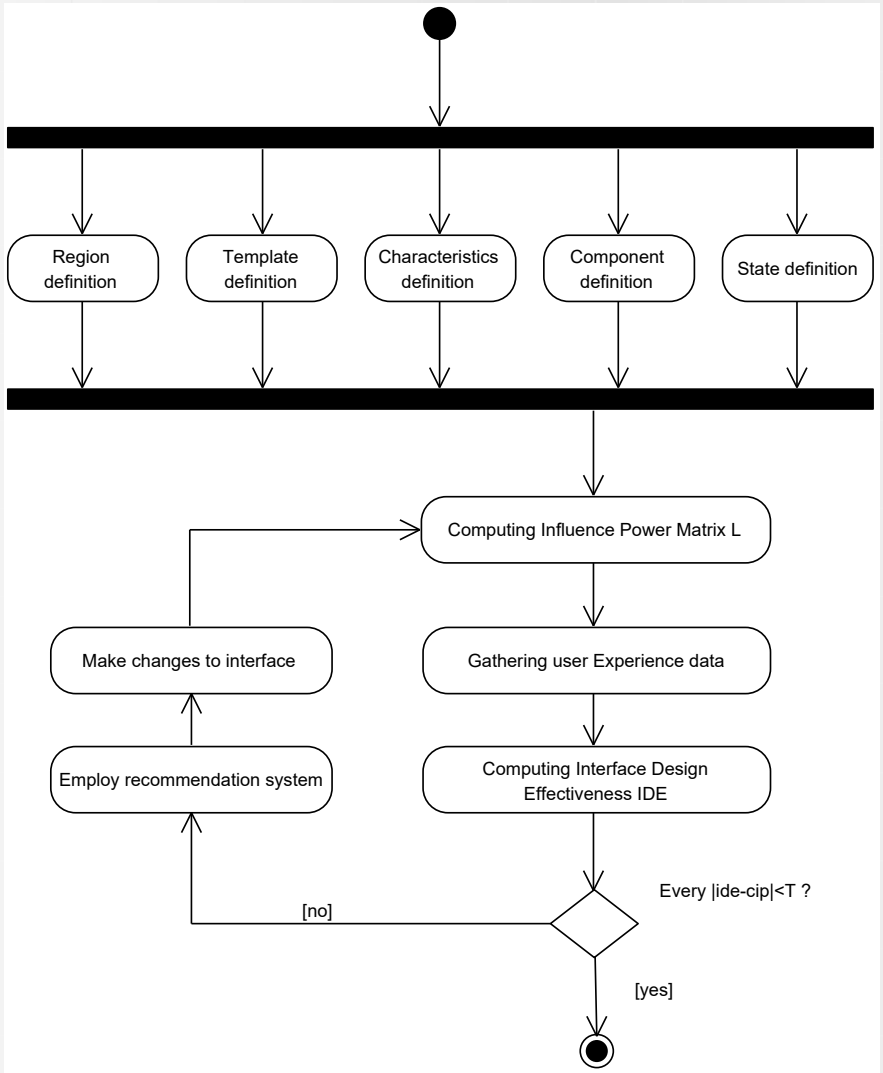

Figure: Algorithm for user interface effectiveness assessment

Conclusions

- the paper introduces general idea for definition of interfaces based on elements such as:
  - templates,
  - regions,
  - characteristics components,
  - interface states,
- the framework that may be used for evaluating of interfaces design and algorithms that aim at its recommendation is proposed,
- the effectiveness of interface design is assessed through computation of IDE matrices,
- the general algorithm for interface recommendation system evaluation has been proposed.

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Thank you for your attention