Reputation Propagation in Composite Services

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The paper discusses the problem of reputation propagation in composite services and proposes a new approach to address it. The proposed approach uses a reputation management system that incorporates feedback from multiple sources to improve the reliability of service recommendations. This approach is shown to be effective in improving the accuracy of service selection in a variety of scenarios.
1. Why is reputation important?
2. What’s so special about composite services?
3. How does one propagate reputation fairly?
Numerous services provide similar functionalities varying in quality
Trust in the provider’s ability to meet the expectations
rules & regulations, third party certificates, reputation
Former consumers’ collective perception
### Recent Feedback Ratings (last 12 months)

<table>
<thead>
<tr>
<th></th>
<th>1 month</th>
<th>6 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>270</td>
<td>882</td>
<td>883</td>
</tr>
<tr>
<td>Neutral</td>
<td>1</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Negative</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

### Detailed Seller Ratings (last 12 months)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Average rating</th>
<th>Number of ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item as described</td>
<td>★★★★★★</td>
<td>661</td>
</tr>
<tr>
<td>Communication</td>
<td>★★★★★★</td>
<td>660</td>
</tr>
<tr>
<td>Shipping time</td>
<td>★★★★★★</td>
<td>659</td>
</tr>
<tr>
<td>Shipping and handling charges</td>
<td>★★★★★★</td>
<td>662</td>
</tr>
</tbody>
</table>
detailed description, 
single value, 
multiple values, ...
2. What’s so special about composite services?
Creation of new services by combining existing ones
Vertical
Example

0.7

E-Shop

Payment

Invoice

Shipment

Transfer

Feedback
1. Different levels of contribution
2. No penalty for the poor performances of others
3. No reward for the good performances of others
4. Level of composition
Respect all four criteria
3. How does one propagate reputation fairly?
Key Idea

Contribution based on the past behaviour
Assumption

high reputation

↓

high contribution
A composite service
an assigned reputation value
a set of $n$ component services
Assignment of weights:

\[ w_c = (w_{s_1}, w_{s_2}, \ldots, w_{s_n}) \]

\[ s_i \in S \quad w_{s_i} \in [0, 1] \]
Example

- E-Shop
  - Payment: $w_p = 1.0$
  - Shipment: $w_s = 0.9$
  - Feedback: $w_f = 0.1$

$0.7 \rightarrow E-Shop$
Reputation of a single service $s$ over a period of time $k$:

$$ r_{k}^{(s,c)} \in [0, 1] $$
Average reputation:

\[
    r_k^{(S,c)} = \frac{\sum_{s \in S} r_k^{(s,c)}}{n}
\]
Example

E-Shop

Payment
\( w_p = 1.0 \)

Shipment
\( w_s = 0.9 \)

Feedback
\( w_f = 0.1 \)

Avg = 0.75
\( P = 0.85 \)
\( S = 0.70 \)
\( F = 0.70 \)
Rate of change:

\[ \Delta r_{(s,c)}^{(s,c)} = \frac{r_k^{(s,c)} - r_k^{(S,c)}}{r_k^{(S,c)}} \]
Difference new vs. average:

\[ \Delta v = v_c - r_k^{(S,c)} \]
Propagated value:

\[ v_s = r_k^{(s,c)} + w_s \cdot \Delta r_k^{(s,c)} \cdot |\Delta v| + \Delta v \]
Example

**E-Shop**

- **Payment**
  - $w_P = 1.0$

- **Shipment**
  - $w_S = 0.9$

- **Feedback**
  - $w_F = 0.1$

**Weights:**
- $P = 0.85$
- $S = 0.70$
- $F = 0.70$

**Average:**
- $Avg = 0.75$
Evaluation & Discussion
Evaluation

\[
\begin{align*}
\nu_c &= 0.7 \\
\kappa^{s,c} &= 0.9 \\
\kappa^{S,c} &= 0.75
\end{align*}
\]
reputation concept, underlying assumptions, records of past behaviour, ...
Surya Nepal, Zaki Malik, Athman Bouguettaya
“Reputation Propagation in Composite Services”
www.flickr.com/photos/mrhermit/3520436835/

www.flickr.com/photos/devos/2620194077/