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Adaptive Collaboration in a Dynamic Environment for Information Sharing

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ABSTRACT

Collaborative systems are used in learning environment to track problem solving methodology. Previously developed collaborative systems were generally concerned with the evolutions and contributions in dynamic environment. However, when evolutions and dynamism are promoted, information sharing among participants is generally compromised, a problem that has not been well addressed. This study has developed adaptive collaborative systems that enabled reuse of information in a dynamic environment that reduced compromise among participants. Access time for adaptive collaboration in a dynamic environment for information sharing was enhanced.

Keywords: *Adaptive collaborative system, Dynamic environment, Participant, Problem solving, Information sharing.*

1. INTRODUCTION

Traditional collaboration systems are typically bundled with a set of tools with pre-specified static workflow and usage patterns (Yu et al., 2008), which are found to be inflexible and incompetent for modern heterogeneous and ever-changing collaboration contexts and computing environments. Collaboration is defined in a variety of ways, many of them explicitly referring to interdisciplinary collaboration (Heinemann et al., 1995). Some authors, including Adigun (2010), strengthen the definition of collaboration by considering the type of problem, level of interdependence, and type of outcomes to seek. Collaboration is both a process and an outcome in which shared interest, or key stakeholders address conflict that cannot be addressed by any single individual. A key stakeholder is any party directly influenced by the actions others take to solve a complex problem. Whilst a collaborative outcome is the development of integrative solutions that go beyond an individual vision to a productive resolution that could not be accomplished by any single person or organization, a collaborative system can engage multiple users or agents in a shared activity usually from remote locations. In recent times, engineering systems have offered a variety of local and web-based applications that attempt to support collaboration by assisting groups in structuring activities, generating and sharing data, and improving group communication. To ensure the quality of collaboration, any systems design needs to analyze and define possible collaboration processes (Janeiro et al., 2012). There are challenges facing emerging web-based technologies that enable distributed users to discover and construct new knowledge collaboratively (Soller, 2007). Previously developed collaborative systems were generally concerned with the evolutions and contributions in dynamic environment (Adigun, 2010). When evolutions and dynamism are promoted, information sharing among participants is generally compromised (Kirkeby, 2011), a Problem that has not been well addressed. This informed these authors to investigate the process of having adaptive collaborative system in a dynamic environment and still achieve the same result with existing collaborative system in a static environment, factoring the possibility of introducing new information to the shared representation of the problem from different environment using the same databank noting the possible divergence of opinion or representations. Therefore, the possibility of repairing those divergences of representations must be considered at each participant level of dynamic environment of adaptive collaborative systems.

This study proposes, through a set of shared ontology's with well-defined semantics, how a dynamic system operates collaboratively and adaptively for information sharing and reuses focusing at problem solving to reduce the compromise among the participants at each level of adaptive collaborative system.

2. MODEL DEVELOPMENT FOR ADAPTIVE COLLABORATION BUILDING

The fundamental elements, the scope of interactivity and the relation between the stages are described in the model based on three concepts: role, route and rule.

a. The role defines the actions and activities assigned to or required or expected of a person or group.
b. The route is characteristically the roadmap, or a re-implementation circuit of the system for mapping

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URLs to application actions, or conversely to generate URLs.

c. The rule is a conditional logic that assesses the status of the workflow process and determines the next steps. In a way, the rule enables the qualitative analysis workflow to be explored based on the elements comprising the dynamic environment.

The three Rs (i.e. concepts) are generally used to measure the evolutions in an adaptive environment. Collaboration raises a few issues of it own, which we factored into developing the subsequent model. The most important issues are communication needs, identity management, shared state information, and performance, which are developed as follows:

R1. Communication Needs.

As an illustration, the participants A, B, C, D, E, F may be communicating differently with central work as a collaborative system sharing information to get their individual needs within the dynamic environment, as demonstrated in Figure 1.

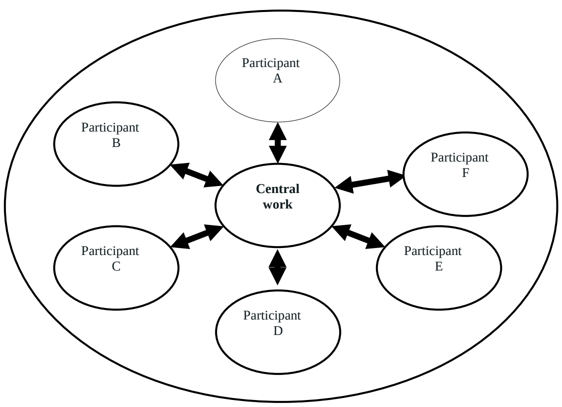

Fig 1: Communication Needs

R2. In the case of Identity management and in order to verify and validate the ontology as regards each participant's identity, we developed a sequential-querying program as shown in Fig 2. Specifically:

<Entity Type Name="Participant"> <Key>
< Participant Ref Name="GSM" />//password because it is the only unique string in the database among the participants

</Key>
<Participant Type="String" Name="GSM" Null able="false" /> because a name can belong to two or more participants. Therefore, GSM is serving as participant's name
<Navigation Participant Name="password"
Relationship="ParticipantsName.PassworddBy"
Relationship="Participants Name. Password By"
From Role="Participant"
To Role="password" /> <Navigation Participant Name="password" Relationship="
Participants Name. GSM By" From Role="Participant" To Role="password" />
// i.e. moving round the platform as a Participant by the use of GSM as unique key
</Entity Type>

Fig 2: Identity management

R3.Shared state information

In the case of shared state information, we developed a shared-information program as shown in Fig 3. Specifically:

```
< ? php
    $submit = $_POST [submit];
    If ($submit)
        $f name = $_POST [f name];
        $l name = $_POST [l name];
        $day = $_POST [day];
        $month = $_POST [month];
        $year = $_POST [year];
        $sex = $_POST [sex];
        $faculty = $_POST [faculty];
        $dept = $_POST [dept];
        $course = $_POST [course];
        $level = $_POST [level];
        $phone = $_POST [phone];
        $pass1 = $_POST [pass1];
        $pass2 = $_POST [pass2];

if(empty($f name) || empty($l name) || empty($day) || empty($month) || empty($year) || empty($sex) || empty($faculty) || empty($dept) || empty($course) || empty($level) || empty($phone) || empty($pass1) || empty($pass2))

        {$message = "Fill all field marked (*)";}
            Else if ($pass1!= $pass2)
        {$message = "Passwords don't matched";}
            Else {include ("addon/dbcon.php");
    $check = my sql _ query("SELECT * from individual WHERE phone ='$phone'");
            If (my sql_ num_ rows($check) != 0)
{$message ="User record already exist";}
            Else
{My sql _ query ("INSERT into individual VALUES ('$f name', '$l name', '$day', '$month', '$year', '$sex', '$faculty', '$dept', '$course', '$level', '$phone')");
My sql _ query ("INSERT into login1 VALUES ('$phone', '$pass1')");

My sql _ query ("INSERT into status VALUES ('$phone', '0')");
```

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Header ('location: confirm.php')}}?>

Fig 3: Shared state information

R4. Performance

The participants A, B, C, D, E, F were synchronized together and form Adaptive Collaborative System that is, Joining them together as a system (use of union) to form a new sentence α in a model M for the proof of completeness that is

i is complete if whenever KB $\models \alpha$, it is also true that KB $\vdash_i \alpha$

Therefore, union (i) is complete if whenever Central work (KB) is entails all participant (α), it is also true that participant(α) can be derived from Central work(KB) by procedure union(i).

(AvBvCvDvEvF)

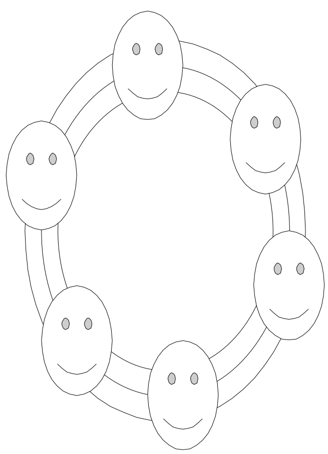

Fig 4: Proof of completeness (use of union)

Extraction of common goals from each participant (use of intersection) to form another sentence α in a model M for the proof of soundness that is

i is sound if whenever KB $\vdash_i \alpha$, it is also true that KB $\models \alpha$

Therefore, intersection(i) is sound if whenever participant(α) can be derived from Central work(KB) by procedure intersection(i), it is also true that Central work(KB) entails participant(α) if and only if participant(α) is true in all worlds where Central work(KB) is true.

(A^E) V (B^D)(C^F)

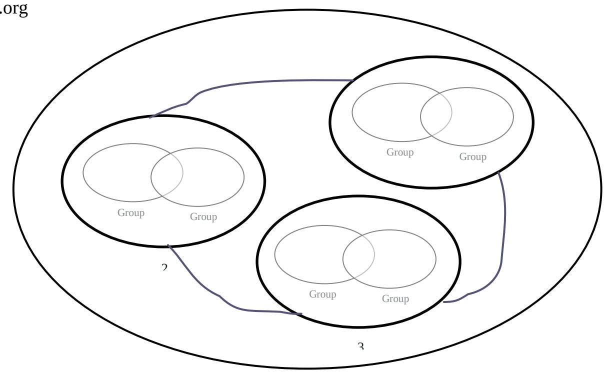

Fig 5: Proof of soundness (use of intersection)

Re-registration to show the level of questions answered at first entrance by the users. Login and logout system.

3. MODEL CONSTRUCTION AND DATA GENERATION

Whilst the three Rs are generally used to measure the evolutions in an adaptive environment, including Fox and Grainger (1998), that involves in building a logical model of the knowledge that is to be specified by means of the ontology, our model is not constructed directly but through the following: Specific formal terminologies for questions were used to define scenarios; Formulation of informal competency questions; and Benchmarks were set to see if questions were answered. The system structured the questions and enabled participants to revisit the scenarios if questions had not been completed. Eight questions were formulated to test the system for information sharing in a dynamic environment. The questions were broken down into four levels; each level consists of two separate questions on a page. Three visitations were possible by a participant. At the end of the third visit, questions were terminated whether it was attempted or not. The questions were made available and were accessed on the system by users between January and June 2010. Forty participants participated in using the platform to solve problems through the interrupt caller on the net.

4. RESULTS AND DISCUSSION

The questions, as outlined in Appendix, were made available and were accessed on the system by users between January and June 2010. Word matching and semantic analyses of information sharing in the database were carried out. The number of participants that visited in January were 15, 0 and 0 for first, second and third visitations respectively. In February it was (20,0,0), March (1,5,0), April (4,15,0), May (0,10,5) and in June (0,5,2). During the first visitation, the total number of participants that answered the formulated questions in January were (15,15,15,0,0,15,15,0), February were (20,20,20,0,0,20,20,0), March were (1,1,1,0,0,1,1,0), April were (4,4,4,0,0,4,4,0), May were (0,0,0,0,0,0,0,0) and June were (0,0,0,0,0,0,0,0). The second visitation for questions 1,2,3,4,5,6,7 and 8 were (0,0,0,0,0,0,0,0) in January, February (0,0,0,0,0,0,0,0), March (0,0,0,0,0,0,0,5), April (0,0,0,0,0,0,0,15), May (0,0,0,0,0,0,0,10) and June (0,0,0,0,0,0,0,5). At the third visitation, responses to the eight questions in the month of January, February, March, April, May and June were (0,0,0,0,0,0,0,0), (0,0,0,0,0,0,0,0), (0,0,0,0,0,0,0,0), (0,0,0,0,0,0,0,0), (0,0,0,5,5,0,0,0), (0,0,0,2,2,0,0,0) respectively. With word matching and semantic analysis, the percentage number of participants that have similar responses to questions 1, 2, 3, 6 and 7 was 62% at first visitation; and to question 8 was 57% in second visitation; while those to questions 4 and 5 was 10 % at third visitation. At the end of the visitations, participants that attempted questions 1, 2, 3, 4, 5, 6, 7, and 8 were 87%, 50%, 45%, 42% 40%, 43%, 35%, and 20% respectively. The average attempt for all questions was 45.25%.

5. CONCLUSIONS

A model has been developed for an adaptive collaborative system that enables reuse of information in a dynamic environment and that reduces compromise among participants. Access time for adaptive collaboration in a dynamic environment for information sharing was enhanced. This model: (1) encourages collaboration through information sharing, team learning and enhances communication, (2) interfaces in a timely manner and adapts to changes appropriately while maintaining and mediating adaptively with online knowledge-sharing communities, and (3) supports integration of information from diverse sources.

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APPENDIX

The following questions were used to test the adaptive collaborative system to analyze, share and reuse the results to solve problems in teaching learning environment. Specifically:

1. What are the analyses of system configuration for computer setup?
2. Highlight the procedures of coupling computer system using hardware components.
3. Enumerate the differences between coupled systems and branded new ones
4. State the advantages of one over the other.
5. Point out the relationships between troubleshooting and repair in computer systems
6. Give the best Option of solving computer system problems; i.e. Either Coupled System, or Branded System.
7. Reasons for selecting either coupled system or branded system as the best option.
8. What is your conclusion about coupled system and branded system?

The administered questions were in the Computer Science domain. We qualified a dynamic environment as an environment that allows the scaling of participant response. This is to say that a user can take his inspiration from another participant. He could work independently or in collaboration. The environment is also collaborative because each user can be connected to responses from other users asynchronously in the database. A previous participation is an input to other participations.