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A CULTURALLY AWARE RESCUE MODEL FOR NATURAL DISASTERS

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Motivated by shortcomings witnessed in recent natural disasters responses; this paper reports on a computational approach that offers techniques for matching social demands of a disaster type with the strengths of human cultural traits among rescue teams. Salient cultural parameters are nominated and an approach for using them in a decision making environment that has the potential for best match between tasks that require certain human capacities with available resources. In our current prototype we used somewhat generic traits as well as general requirements for illustration purposes. The stable matching algorithm is adapted to obtain the allocation of tasks for rescue groups. Our methodology heralds a novel blue print for avoiding miscommunications that are commonplace due to inappropriate assignment of people to tasks. For each disaster, or at least for each category of disaster, specific traits and requirements need to be carefully identified. For successful matching, steps we outline may be followed. We are planning on further studies that validate our methodology reported in this paper with more refined details.

Keywords: Disaster Response, Agent-based simulation, Stable Matching, culture

1. Introduction

Developing countries suffer the greatest costs when a natural disaster occurs (Wisner, et. al., 2004). More than 95 percent of all casualties caused by disasters occur in developing countries and losses due to natural disasters are 20 times greater in developing countries than the losses in industrialized countries (Alexander, 2002). This main reason behind this is lack of good infrastructure and disaster response is relatively slower and inefficient when compared to developed countries where adequate funds are not allocated to prediction and early warning systems.

Poorly managed disasters are observed as the consequence of inappropriately managed risk and are the ultimate test of emergency response capabilities. Disasters have occurred for many years. Disasters such as the tsunami in 2004 and hurricane Katrina in 2005 provided opportunities to learn and improve policies and practices of disaster management (Allen, 2007). Proper disaster response requires a variety of resources and skills crossing many disciplines; robotics and agent research communities can play a significant role in enabling efficient coordination of disaster response teams (Sycara, et. al., 2006). Disaster response typically involves multiple teams working together to stem the effects of a variety of emergencies that arise, often under highly dynamic conditions. Thus the disaster response domain represents significant challenges for task allocation (Jones, et. al., 2006). During the Haiti earthquake in 2010, a “cluster” system that the

United Nations devised after the 2004 Indian Ocean Tsunami was put into place. The cluster mechanism permits UN agencies to take the lead in coordinating the humanitarian response in specified sectors. For example, UNICEF (United Nations Children's Fund) is responsible for water and sanitation; the WFP (World Food Program) is responsible for food and logistics; the WHO (World Health Organization) is responsible for health (Goldberg, 2010).

Disaster management involves pre-disaster planning, preparedness, monitoring including relief management capability. It is important to have prediction and early warning. It also involves damage assessment, task allocation and relief management and documentation of the efforts (Taylor, et. al., 1970). A systems perspective in disaster preparedness requires inter-organizational planning. Good planning must be based on systematic research knowledge. Some of the most critical difficulties in disaster response are due to the lack of inter-organizational coordination (Heide, 1989). Good planning involves educating others as well as oneself (Zaman, 1999).

Response groups must be given tasks that are acceptable to them and the ones they are most skilled to perform. Groups are more likely to interface if the contact is not with total strangers (Hexmoor, et. al., 2008). Hence, it would be beneficial to assign a particular task to a group of the same cultural background since agents within the group are socially more attractive and trustworthy. If a task is allocated by the leader without interacting with the groups, it might not be acceptable by the groups since they might be better skilled to perform a task than the one allocated to them. Major calamities such as the recent Haiti earthquake require multifaceted responses, at times from teams with very different national, geographic, and ethnographic backgrounds. Coordination among diverse cultural groups requires rich understanding of cultural differences among rescuers as well as the cultural determinants of the calamity. Our interdisciplinary research describes a nascent model of matching available rescue teams with the problem requirements. We are endeavoring to develop computational models that draw upon multiagent systems modeling techniques for addressing this problem.

Some disasters are consequence of inappropriately managed risk and become ultimate tests of emergency response capabilities. We have witnessed several major disasters in recent history. While disaster response requires a variety of resources and skills crossing many disciplines; robotics and agent research communities can play a significant role in enabling efficient coordination of disaster response teams. Disaster response typically involves multiple teams working together to stem the effects of a variety of emergencies that arise from disasters, often under highly dynamic conditions. Thus the disaster response domain represents significant challenges for task allocation. (Jones, et. al., 2006).

A reason that lessons about disasters are not fully learned is that it is difficult for emergency responders and planners to gauge accurate information about what occurs in disasters (Vinas, 1998). Despite the fact that a significant amount of disaster information has been collected, much of it is not easily accessible to emergency responders and disaster planners because. In summary:

1. Much of the research is recorded in unpublished reports, out-of-print books and technical journals that are not circulated among the emergency responders.
2. Many reports are written using technical terminology that, while appropriate for the academic audience for which they are written, it may be difficult for others to understand (Kenardy and Carr, 2000).

A leader is indispendable for understanding salient aspects of disaster planning and responses to it. To some extent she must understand the background of the disaster response teams and the group that is being catered. The everyday emergency systems are not always well adapted to address disaster requirements (Zaman, 1999; Wenger, et. al, 1975). Hence, she should also be able to document the plans that are implemented and the problems that were faced while implementing these plans for future use.

Importance of a leader during the disaster response is profound. When a major disaster such as the Haiti earthquake occurred in 2010, a "cluster" system that the UN devised after the 2004 Indian Ocean Tsunami was established. The cluster mechanism permits certain UN Agencies to take the lead in coordinating the humanitarian response in specified sectors. For example, UNICEF is responsible for water and sanitation; the WFP is responsible for food and logistics; the World Health Organization is responsible for health. Without a leader guiding the groups the response efforts might not be efficient due to the dominance by certain groups, the groups might not respond in time, the groups that respond might not have the required resources (Johnson, 1988; Forester, 1989).

Each responding group is represented by an intermediate leader who guides her group and acts as a liaison between the leader and the group. The intermediate leader has the highest power in the group and is capable of making decisions on behalf of the group. This model encourages information exchange unlike historical models. Disaster management involves:

1. Pre-disaster planning, preparedness, monitoring including relief management capability
2. Prediction and early warning
3. Damage assessment, task allocation and relief management (Faupel and Kartez, 1996)

A systems perspective in disaster preparedness requires inter-organizational planning. Some of the most critical difficulties in disaster response are due to the lack of inter-organizational coordination. Disaster preparedness cannot be accomplished unless the plan is known by the participants and the role each of them plays (Wraith, 1997). Disaster plans must be acceptable to the elected officials, the departments that will implement them, and even to those the plan is intended to benefit, the public. The consequence of ignoring this principle is that the resulting plans may also be ignored.

One aspect of disaster planning often overlooked is the importance of the process. The groups must be given the tasks that are acceptable to them and the ones they are most skilled to perform. Groups are more likely to interface if the contact is not with total strangers. Hence, it would be beneficial to assign a particular task to a group of the same cultural background since agents within the group are socially more attractive and trustworthy. If a task is allocated by the leader without interacting with the groups, it might not be acceptable by the groups since they might be better skilled to perform a task than the one allocated to them (Woelfel and Nicolas, 1984; Kunreuther, 1998).

In contrast to the traditional approach to disaster planning, where the authorities establish planning requirements for the responders, there is a new and more effective model. This new approach is for the coordinator to determine the needs and to plan the tasks that must be accomplished and establish multi-agent coordination arrangements. This model paves the way for developing the "Man On The Loop" (MOTL) paradigm, a novel human supervision role that contrasts with typical micromanagement. The human

intervention indirectly affects actions at the unit or agent community level (Hexmoor, et.al., 2008).

In previous models, culture was not been emphasized during task assignment. However, in reality cultural parameters are fundamental engineering instruments for monitoring and directing culture in large groups (Starosta, 1984). To improve the current automation level we selected the most widely explored cultural parameters given by social scientists, notably by Dr. Hofstede (Hofstede, 2001). These parameters will place emphasis on the cultural background of the disaster response groups and the cultural background of the group that is being catered. It provides leverage for performing high-level decision making to a human supervisory body as presented in the "Man On The Loop (MOTL)" paradigm.

Key assumptions are made while implementing our model:

1. The leader/planner has the highest power in the system and all the groups accept him as the leader
2. Leader could be an individual or an organization comprised of members from different countries such as the UN
3. The leader has sufficient knowledge about the various tasks that must be performed and also the cultural background of the disaster response teams
4. The intermediate leader belongs to the group he is representing and has higher power than the members of his group. Every agent in the group is capable of being a leader, however a leader is randomly chosen
5. The agents are truthful and rightly gauge their capabilities. We assume the groups do not cheat while calculating the fitness trait sum for each task
6. All agents in a group are homogenous and benevolent. These agents self-synchronize to achieve common goals
7. The groups do not cross each other's path
8. All groups have equal number of members
9. Learning and rewards are not implemented

Constraints of our model:

1. We assume that there is a leader available who has the necessary knowledge and experience to lead the responding groups. We assume that these groups accept and follow the leaders' decisions. In reality, it is difficult to find a leader who is universally accepted
2. Our model might lack realism since the stereotypical behaviors of groups are considered while the leader creates the allocation list.
3. We assumed that the groups are congruent with minimal conflicts.
4. Multiple skills and traits are essential to completing each task; however this model considers only the two most prominent characteristics required for each task.
5. Groups might not have equal number of members and might not be equally skilled in performing multiple tasks, thus the ultimate matching obtained might not be optimal.
6. In reality, some groups might be required to perform multiple tasks, unlike the one-to-one matching assumed in this model for simplicity.

2. Related Work

Culture is defined as the shared patterns of behaviors and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization. Culture is the ways we think, feel and act which we share with others. It is expressed in relationships and artifacts. They are underpinned by often invisible beliefs and values. Cultures are not inherited like body type, hair color or personality; it is learned. (Tuli and Hexmoor, 2010).

A group represents the extent to which people are driven by or restricted in thought and action by their commitment to a social unit larger than the individual (Rogge, 1996). We use the MOTL paradigm where, the human supervisor employs psychological and social influences to control the system behavior. MOTL alleviates excessive dependence on the human supervisor unlike MITL (Man In The Loop) where human interference directly affects actions of the agent. We emphasize the notion of grouping in MOTL since when individuals are of the same ethnicity, results have shown that the agents within the group are socially more attractive and trustworthy (Hexmoor, et. al., 2008). Automating the tedious lower levels will allow the supervisor to focus on performing high-level cognitive tasks more efficiently.

The groups that respond could either be homogeneous groups consisting of members from the same cultural background or we could have multinational groups (Wenger and Barbara, 1986). In a research conducted at the Air force Research Laboratory, direct and indirect effects of diversity are explored (Warren, et. al., 2005). They argue that cultural diversity can have both positive and negative effects on the performance of multinational groups. Positive effects can stem from the wide variety of experiences and methods that a culturally diverse team can draw on to plan and to develop innovative or efficient solutions to a complex problem.

Cultural diversity can also lead to miscommunications and misunderstandings during task execution. In a complex task involving separate planning (discussion amongst the members while calculating characteristic values) and execution phases (carrying out the allocated task), it is hypothesized that cultural diversity promotes better strategy and richer ideas arising from the interaction of the team as a whole during the planning phase.

Furthermore, it is hypothesized that potentially positive effects from good planning can be partially countered in the execution phase since cultural diversity can lead to poorer communications and misunderstandings which arise from the many separate one-on-one conversations which take place during the execution phase concluding that under certain circumstances, team cultural diversity can produce superior performance in complex tasks which require separate phases for developing strategy and task execution. Also under different circumstances, team diversity can hinder performance as shown in the Figure 1.

Figure 1 represents the two-factor opposing-mechanism model of cultural-diversity effects on a complex team task. It has a much richer role for culture to play allowing for both direct and indirect effects. Furthermore, the effects of cultural diversity need not always be influenced by communication problems.

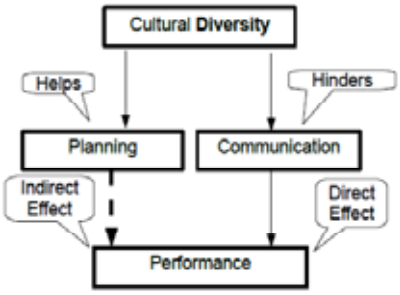

Fig. 1. Relation between Cultural Diversity and Performance (Warren, 2010).

In theory, this model tests the efficiency of the groups with cultural similarity. Good planning, resource allocation, and situational awareness depend on good communication and coordination. In turn, good communication and coordination are facilitated by sharing a common culture as shown in figure 2, (Warren, et. al., 2005)

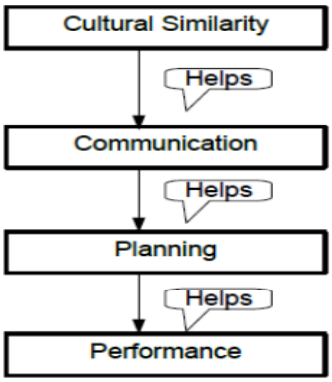

Fig 2. Relation between Cultural similarity and Performance (Warren, 2010)

3. Methodology

When a disaster strikes, the leader or a group of leaders are responsible for assessing the kind of damage that has occurred and the response that is required. As a simplification, we assume that there are equal number of tasks and groups that respond. Each group consists of agents from the same cultural background and they are homogenous, indicating that every agent is from the same cultural background and possesses similar skills and capabilities as the other agents in the same group.

No group performs more than one task and every responding group performs at least one task. We assume that each group performs a separate task; and that groups do not interact with each other. The basic model for task allocation is as shown in Figure 3. The double-ended arrow in the figure suggests that the information flows both ways.

The leader/planner is shown at the top of the figure. The leader could be an individual, a group of leaders or an organization. This model consists of eight responding groups, each represented by an intermediate leader. The model could be scaled up in future to accommodate more groups.

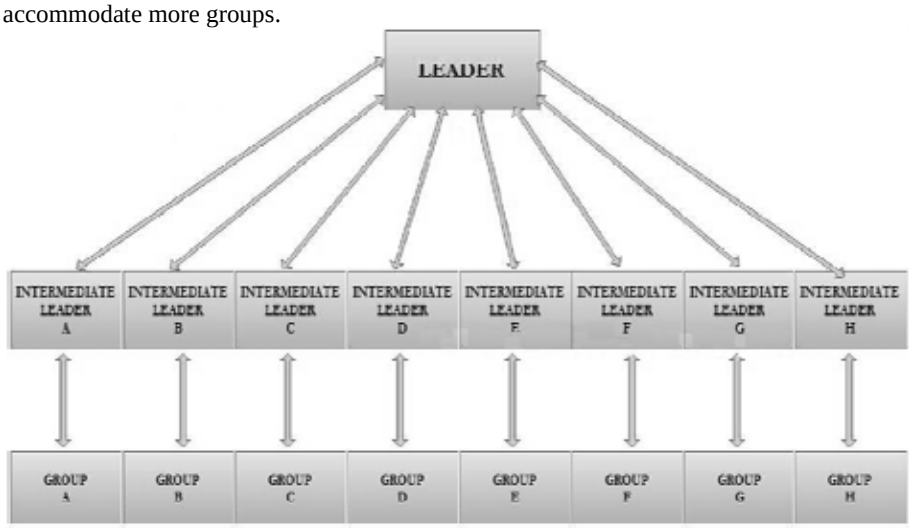

Fig 3. Leader - Intermediate Leader - Group Model

Below are the steps describing the communication between the leader, intermediate leaders and their respective groups.

Step 1: Leader

- The leader generates a list of tasks, Task[i] = [0 1 2 3 4 5 6 7]
- The leader hands down Task[i] to the intermediate leaders
- The leader also hands downs the desirable characteristics list associated with each task to the intermediate leaders
- Based on the leaders understanding of the groups, he generates a preference pair list, Pref[task][group] in decreasing order of preference. For each task, most to least groups are indicated.
- Many cultural characteristics can define each group; however, we are considering the ones specified by the leader that are deemed the best for completing a specific type of task.

Step 2: Intermediate Leader

- The intermediate leader belongs to the group he is representing
- The intermediate leader has higher power compared to the rest of the members of the group
- Once the tasks and the desirable characteristics are handed down to the group, the intermediate leader discusses them with its group members
- The eight groups are represented in a list as Group[j] = [A B C D E F G H].
- Each group computes the fitness trait sum for each task and generates a preference list of tasks in descending order; i.e., a preference matrix, Pref[group][task].

Nominal tasks in this model are the following:
1. Distributing Food
2. Search and Rescue
3. Triage
4. Interacting/Logistics
5. Protection/Security
6. Medical Aid
7. Child Services
8. Post Disaster Trauma Relief

The leader provides tasks to intermediate leaders. Each task is associated with the two topmost required cultural traits. In more detailed models, tasks will require more than a pair of characteristic cultural traits. Here we outline salient traits we've nominated for each task.

Task 1: Distributing Food

Conscientiousness: Conscientiousness is one of five key traits in the "Big Five model" of personality. This is a tendency to show self-discipline, acting dutifully and aim for achievement; i.e., task completion. It includes elements such as carefulness, thoroughness, organization and need for achievement. The trait shows a preference for planned rather than spontaneous behavior. It influences the way in which we control, regulate, and direct our impulses. Conscientious groups are hard working, goal oriented and reliable. These groups are driven by success.

Egalitarianism: Egalitarianism promotes equality, which means all people should be treated as equals. Groups must possess this trait so that they are not unfairly inappropriately biased while performing this task. This is a belief in human equality especially with respect to social, political, and economic affairs.

Task 2: Search and Rescue

Perseverance: This task requires steady, persistent action in spite of difficulties, obstacles, or discouragement. Perseverance is commitment, hard work, patience and endurance. A group that possesses this trait is able to bear difficulties calmly and without complaint. Hallmrk of this trait is the ability to keep trying again and again.

Task-cohesiveness: Task-cohesiveness is a trait that brings group members closer together. It is the degree to which members of a group work together and share common goals to complete a specific task. The forces that push group members together can be positive or negative. In this model the passion to achieve the common goal and cultural similarity brings the agents together (Babbie, 1989).

The more the group members are similar to each other on various characteristics the easier it would be to reach cohesiveness. People feel closer to those whom they perceive as similar to themselves in terms of external characteristics or internal characteristics. People with a similar background generally share similar views on various issues, including group objectives, how to communicate and the type of desired leadership.

Task 3: Triage

Deliberation: Triage is a very sensitive task. Thus, a careful and thoughtful consideration and discussion regarding all sides of an issue must be observed before reaching a final decision. The group must be rational and must reach a unanimous decision before proceeding. Sometimes a lengthy discussion might be required to reach a unanimous decision.

Agreeableness: Agreeableness is one of five traits in the big five model of personality. It is a tendency to be pleasant and accommodating. Agents possessing this dimension are considerate, friendly, generous, and helpful. This dimension of personality was initially discovered in research using the method of factor analysis.

Task 4: Interacting/ Logistics

Individualism: Individualism is one of the five dimensions of culture (Hofstede, 2001). It is a dimension that measures how much members of the culture define themselves apart from their group memberships. Individualism honors virtues of independence, autonomy, and self-reliance. Individualists promote the exercise of one's goals and desires.

This trait is important while performing this particular task because the group is generally split into several sub-groups or individuals are assigned specific tasks which require autonomy and the ability to take decisions without consulting the entire group (O'Brien and Dennis, 1992).

Openness: Openness is one of the Big Five personality traits. This trait distinguishes imaginative people from down-to-earth, conventional people. People who are open to experience are intellectually curious, appreciative of art, and sensitive to beauty. Openness involves active imagination, appreciation for unusual ideas, aesthetic sensitivity, attentiveness to inner feelings, preference for variety and intellectual curiosity.

Task 5: Protection/Security

Uncertainty Avoidance: Uncertainty avoidance focuses on the level of tolerance for uncertainty and ambiguity within the group in unstructured situations. A high Uncertainty Avoidance ranking indicates the community has a low tolerance for uncertainty and ambiguity. This creates a rule-oriented society that institutes laws, rules, regulations, and controls in order to reduce the amount of uncertainty.

A low Uncertainty Avoidance ranking indicates the community has less concern about the ambiguity and uncertainty and has more tolerance for a variety of opinions. This is reflected in a group that is less rule-oriented, more readily accepts change, and takes more and greater risks.

Collectivism: Collectivism is one of the five dimensions of culture in (Hofstede, 2001). This dimension measures how much members of the culture define themselves apart from their group memberships.
It emphasizes the interdependence of every agent in some collective group and the priority of group goals over individual goals. Collectivists focus on community and

society, and seek to give priority to group rights over individual rights. (Turner and Killian, 1972)

Task 6: Medical Help

Power Distance: Power distance refers to the extent to which less powerful members expect and accept unequal power distribution within the culture. It focuses on the degree of equality, or social inequality, among agents in the community measuring how much a culture has respect for authority.

Power distance shows variation among agents even within a community. Differences are manifested in interpersonal power and influence between superiors and subordinates. When agents differ in power, they face problems. Agents with high Power Distance Index tend to have centralized political power. Agents may view the supervisor as a benevolent dictator and obey her orders. A high PDI ranking indicates the inequalities of power and social values like autonomy, trust, reliance and benevolence, will be allowed to grow within a group. It is acceptable for a supervisor to display her authority

A low PDI ranking indicates that the group deemphasizes the differences between agent's power and social values. In these groups, equality and opportunity for every agent is stressed. If PDI is low then the system accepts and expects unequal distribution of power. If PDI is low we see more egalitarian working patterns and team interchanges. In a low PDI culture, a supervisor is expected to treat agents respectfully; agents may do important work. Hence, it is important for the team providing medical help to have low Power Distance Index.

Cooperativeness: Cooperation is the process of working or acting together, which can be accomplished by both intentional and non-intentional agents. Agents must be compliant to working with each other in harmony.

Task 7: Child Services

Benevolence: Benevolent agents willingly perform all tasks requested by their acquaintances and volunteer their services to others if they have sufficient free capacity. When agents know one another, they develop a balance of good will and help toward one another.

Agents strengthen their ties as they interact about their assigned tasks and delegate tasks to others who are benevolent (Tuli and Hexmoor, 2010). A benevolent agent takes the welfare of others into account. Due to the benevolent character, the agents follow some social actions.

Compassion: Compassion is a human emotion prompted by the pain of others. This trait commonly gives rise to a desire to alleviate another's suffering.

Task 8: Post-disaster Trauma Relief

Trust: Trust is in the degree of belief in validity of messages. It is a mechanism for overcoming uncertainty and introducing stability into transaction. Trust can be defined as a function of a basic trust attitude toward another agent and the value of the object trust.

The group that is being catered to must be able to trust the agents they are interacting with. The notion of trust changes as the relationship between agents and victims moves from impersonal to personal. Strengthening ties between agents and the disaster victims increases their interpersonal trusts. An agent's trust in others generates benevolence and return of trust. Therefore, an agent who trusts is likely to experience autonomy. (Tuli and Hexmoor, 2010)

Empathy: Empathy is the capability to share another being's emotions and feelings. It is the intellectual identification with or vicarious experiencing of the thoughts and attitudes of another. Empathy begins with awareness of another person's feelings.

Step 3: Stable Matching

Step 3 is the last step as a process of matching tasks for groups (Gusfield and Irving, 1989). As described in Step 1, the top leader provides the groups with eight tasks and for each task specifies a pair of predetermined cultural trait that characterize it. These tasks are handed down to the intermediate leader that represents each group, the leader interacts only with the eight groups leaders. This circumvents micro-mangement and it abides by the MOTL paradigm.

Once the intermediate leader has the list Task[i] and the cultural traits for each task Cul[i][j], she interacts with her respective group and computes a local fitness value for each pair of traits per task. The fitness value for each trait is computed as a floating number between 0 and 1. Each group produces a fitness trait sum for each task, CulSum[z][i], where z is the group from 0 to 7 and i is the task from 0 to 7. Subsequently, each group orders their task fitness from the highest to the lowest according to their local fitness values. This process produces how each group perceives themselves to be the culturally appropriate group for the task. The intermediate leader hands this list to the top leader. The top leader now prepares the list Pref[group][task] based on the lists handed to him by all groups. The list Pref[group][task] must be matched with the leaders list Pref[task][group] to obtain the final task allocation. This is performed using the Gale-Shapley algorithm (i.e., Stable matching) (Shapley and Gale, 1962).

Our implementation consisted of several stages. The first step in the implementation process was carried out by the leader. Based on the disaster response needs, the leader generates a task list Task[i]. The leader determines that eight tasks must be performed and there are eight responding groups. The leader also generates a pair of cultural traits for each task, Cul[i][j] as shown in a prototypical figure 4. The leader generates a preference list, Pref[task][group] based on previous experience and knowledge about the responding groups as shown in figure 5. The leader transfers the lists Task[i] and Cul[i][j] to the eight intermediate leaders.

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TASK-CULTURAL TRAITS LIST:

Task 0: Distributing Food              - Conscientiousness          ; Egalitarianism
Task 1: Search/Rescue                  - Perseverance               ; Task-cohesiveness
Task 2: Triage                         - Deliberation               ; Agreeableness
Task 3: Interacting/Logistics          - Individualism              ; Openness
Task 4: Protection/Security            - Uncertainty Avoidance      ; Collectivism
Task 5: Medical Aid                    - Power Distance             ; Cooperativeness
Task 6: Child Services                 - Benevolence                ; Compassion
Task 7: Post Disaster Trauma Relief    - Trust                      ; Empathy
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Fig 4. Task-Cultural Traits List

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LEADER PREFERENCE LIST:

Task 0: 0, 1, 2, 3, 4, 5, 6, 7
Task 1: 1, 2, 3, 4, 5, 6, 7, 0
Task 2: 2, 3, 4, 5, 6, 7, 0, 1
Task 3: 3, 4, 5, 6, 7, 0, 1, 2
Task 4: 4, 5, 6, 7, 0, 1, 2, 3
Task 5: 5, 6, 7, 0, 1, 2, 3, 4
Task 6: 6, 7, 0, 1, 2, 3, 4, 5
Task 7: 7, 0, 1, 2, 3, 4, 5, 6
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Fig 5. Leader Preference List

An important objective this model fulfills is that it prevents the leader from micro-managing and hence all communications are performed through the intermediate leaders. Since time is critical during disaster response, this might lead to faster and more efficient communication.

When the leader hands down the task list Task[i] and the cultural traits list Cul[i][j], the intermediate leader for each group interacts with the group members of their own group and calculate the fitness value for all traits. This is generated between 0 and 1 for each trait. This is the second step in the implementation process. The third step involves the computation of the fitness sum by the eight groups for each task CulSum[z][i]. for brevity, we omit depiction of intermediate group values. With the preference lists Pref[group][task], and Pref[task][group], we perform stable matching to assign tasks to the groups. Group preference is given priority over leaders preference and the leaders list is used for breaking ties as described in the stable matching algorithm.

The leaders' preference list always contains unique assignments for different pairs of tasks. For example, no two groups could be the first preference for two different tasks.

This is based on the assumption that all the responding groups are capable of accomplishing more than one task at least.

4. Conclusions

Our preliminary observations indicate that most groups are assigned their first preference and the leaders' choice is used only if more than one group preferred the same task. In theory, cultural parameters are used to make decisions about which task suits a group better. However, in our implementation the lists are pre-generated and then the stable matching algorithm is used to obtain the allocated tasks for these groups. We believe attention to cultural traits can provide superior match between available disaster response resources and the needs. This report heralds a path in this direction. Further studies are needed to explore countless cultural nuances embedded in human interactions in disaster response.

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