UDC 623.764

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SOLVING SOCIAL PROBLEMS BY DISTRIBUTED HUMAN TERRAIN OPERATIONS

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Анотація. *Поняття «людський ландшафт» (ЛЛ) вперше було використано у військовій галузі для можливого скорочення людських жертв у міжнародних конфліктах шляхом спеціальної роботи з місцевим населенням, враховуючи його особливості та потреби. На відміну від географічного ландшафту, ЛЛ має справу з соціальними, етнічними, культурними, релігійними та економічними властивостями людських угруповань. Знаходячи ідеї ЛЛ корисними і своєчасними, ми розширюємо їх використання за межами тільки військової галузі, а саме для вирішення різноманітних соціальних проблем як у національному, так і міжнародному масштабі, використовуючи для цієї мети розроблену високорівневу мережеву ідеологію та технологію. Остання дозволяє аналізувати й обробляти великі розподілені простори, включаючи ЛЛ, шляхом їх динамічного покриття інтелектуальними інфраструктурами, що забезпечують глобальну обізнаність та цільову орієнтацію.*

Ключові слова: *соціальні організації, мережеві системи, людський ландшафт, технологія просторового захоплення, паралельна інтерпретація, просторові сценарії, системна цілісність.*

Аннотация. *Понятие «человеческий ландшафт» (ЧЛ) впервые было использовано в военной области для возможного сокращения человеческих жертв в международных конфликтах путем специальной работы с местным населением, учитывая его особенности и потребности. В отличие от географического ландшафта, ЧЛ имеет дело с социальными, этническими, культурными, религиозными и экономическими свойствами человеческих группировок. Находя идеи ЧЛ полезными и своевременными, мы расширяем их применение за пределы только военных областей, а именно для решения всевозможных социальных проблем как в национальном, так и международном масштабе, используя для этих целей разработанную высокоуровневую сетевую идеологию и технологию. Последняя позволяет анализировать и обрабатывать обширные распределенные пространства, включая ЧЛ, путем их динамического покрытия интеллектуальными инфраструктурами, обеспечивающими глобальную осведомленность и целевую ориентацию.*

Ключевые слова: *социальные организации, сетевые системы, человеческий ландшафт, технология пространственного захвата, параллельная интерпретация, пространственные сценарии, системная целостность.*

Abstract. *The Human Terrain (HT) concept was originally introduced in military for a possible reduction of the loss of lives in international conflicts by appropriate work with local population, like taking into account its peculiarities and needs. In contrast with geographical terrain, HT deals with social, ethnical, cultural, religious, also economic features of human groupings. Considering the HT ideas productive and timely, we are extending their use beyond traditional military areas – for solving diverse social problems, both national and international, using the developed high-level networking ideology and technology. The latter allows large distributed spaces, HT including, to be analysed and impacted by their dynamic coverage with intelligent infrastructures providing global awareness and goal orientation.*

Keywords: *social organizations, networked systems, human terrain, spatial grasp technology, parallel*

interpretation, spatial scenarios, system integrity.

1. Introduction

The 21st century has presented the world with many new challenges. These include numerous ethnic and religious conflicts, failed states, global terrorism, weapons of mass destruction (WMD) proliferation, cyber-attacks, climate change, and transnational crime, which can result in direct threats to national and international security [1], and the location of these threats is shifting in space and time. Others dealing with employment insecurity, growing inequality, macroeconomic instability, food shortage, where over 850 million people in the world are undernourished.

Many of these numerous challenges often lead to the increase of national and international tensions, which are still being resolved (at least attempted to) with the use of military force. This is becoming enormously and increasingly dangerous as the world has accumulated huge amount of most powerful weapons, nuclear ones including, which can destroy the whole planet within minutes, even if triggered unintentionally or accidentally.

Taking these facts into account, we should try, as much as can, to find and use quite different and much safer means for resolving numerous conflicts and problems, and these may include diplomatic, economic, social, and cultural measures rather than weapons. This paper relates to a very new but currently rapidly developing trend, called Human Terrain (HT) [2–10], which is based on analyzing complex problems in and between human societies through their anthropological, cultural, ethnic, political, and communicational dimensions, with finding effective mechanisms for resolving crises by nonmilitary means. It offers a special high-level networking ideology and technology, having many researched applications [11–23], for practical support of HT ideas in solving diverse human problems, generalized here as social, peacefully.

2. Geographic and Human Terrain

2.1. Geographic Terrain

Geographic terrain, or merely terrain [24], is used to represent vertical and horizontal dimensions of land surface (see Fig. 1). This is usually expressed in terms of elevation, slope and orientation features. Terrain affects surface water flow and distribution. Over a large area, it can affect weather and climate patterns.

Fig. 1. Examples of geographic terrain and its representation

The understanding of terrain is important for many reasons. The terrain of a region determines its suitability for human settlement. An understanding of terrain is also basic to both defensive and offensive strategies. Knowledge of terrain is vital in aviation, especially for low-flying routes and maneuvers and airport altitudes. Terrain affects range and performance of radars and terrestrial radio navigation systems.

2.2. Human Terrain (HT)

Human terrain deals with human population (see Fig. 2), its culture and interactions, being a new and rapidly growing field of research, having originated, as a term, from military operations [25].

Fig. 2. Human terrain examples

All conflicts are usually about people: their behaviors, attitudes, fears, social structures, family and ideological ties and narratives. Understanding the human dimensions of conflict is therefore a critical determinant in preventing conflict, shaping it and influencing the actors involved. It contributes to strategic awareness, ability to plan and execute operations, helps to identify threats and opportunities.

Human Terrain is originally defined as: characterizing cultural, anthropological, and ethnographic information about the human population and interactions within the joint operations area. Human terrain analysis is the process through which understanding of the human terrain is developed. It integrates “human geography and cultural information” [25].

In most general form, human terrain can be viewed as a large spatial network representing human individuals as nodes and links express different relations between them in both virtual and physical worlds (for the latter, for example, as physical distances between nodes), see Fig. 3.

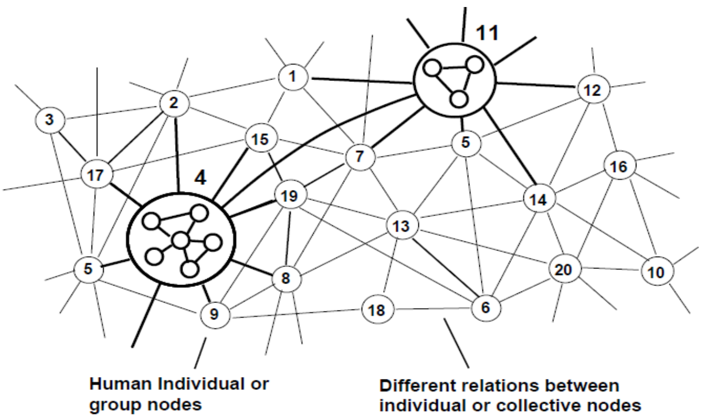


Fig. 3. Human terrain as a large distributed network

This network can be nested as nodes may represent not only human individuals but their specific groups or collectives too, with links to other individual or group nodes, and this nesting may be multilevel. Nodes, except names and other (numerous) attributes, may have addresses or positions in both physical and virtual spaces.

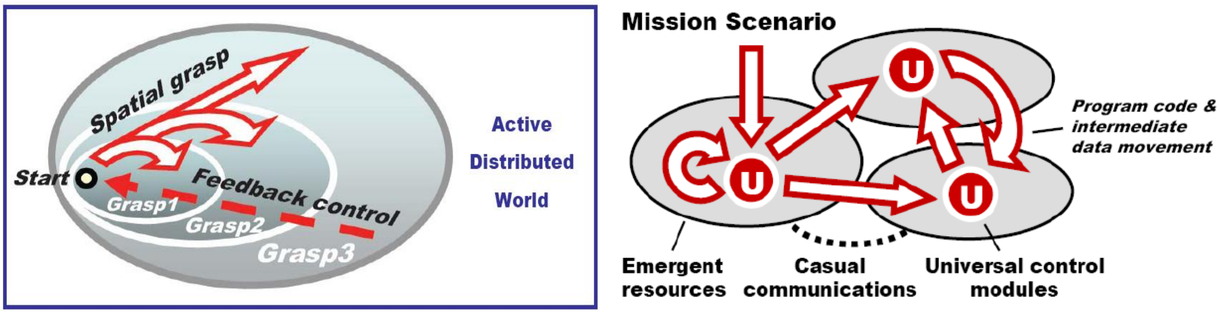
Most HT problems can be formulated and solved on such networks. HT may be very large, distributed, and active, constantly changing in space and time. Usually, it cannot be comprehended from a single point, even in principle, and its effective parallel and distributed processing, management, and simulation are needed, to be dealt properly.

The current paper offers a universal technological support for advanced HT-related systems based on their representation as large distributed knowledge networks, which may be suitable for a variety of important applications.

3. Spatial Grasp Model and Technology, SGT

3.1. SGT Basics

The considered high-level networking paradigm (summarized in Fig. 4) is based on a formalized wavelike seamless comprehension, coverage, or grasping of distributed physical and virtual spaces (Fig. 4*a*).



a *b*

Fig. 4. SGT basics: *a)* incremental comprehension of distributed worlds;
b) self-spreading, covering, and matching scenarios

This believably inherits of how human mind operates [26] in comprehension of distributed environments, in a holistic [27], gestalt-based [28] and integral way, finding complex spatial solutions in them. These features are placed in our case on advanced highly parallel and fully distributed networking platforms often exhibiting advantages before biological systems in complex, especially distributed, nonlinear and multi-loop environments [29].

The approach in general works as shown in Fig. 4*b*. A network of universal control modules U, embedded into key system points (like humans, robots, smart sensors, mobile phones including), collectively interprets mission scenarios expressed in a special high-level Spatial Grasp Language (SGL). These scenarios, capable of representing any parallel and distributed algorithms, can start from any node while covering the whole system or its parts needed at runtime, spatially matching the distributed environments without any central resources.

SGL scenarios, often expressing top semantics of spatial operations, are very compact and can be created on the fly. Different scenarios can cooperate or compete in a networked space as overlapping fields of solutions. Self-spreading scenarios can create runtime knowledge infrastructures distributed between system components. These can effectively support distributed databases, advanced command and control, global situation awareness, as well as any other computational or control models.

The development history, various philosophical and technological aspects of this Spatial Grasp Technology (SGT) as well as detailed descriptions of its researched areas can be found elsewhere, including [11–23].

3.2. Spatial Grasp Language, SGL

SGL differs fundamentally from traditional programming languages. Rather than working with information in a computer memory as usual, it allows us to directly move through, observe, and make any actions and decisions in fully distributed environments, whether physical or virtual. In general, the whole distributed world which may be dynamic and active is considered in SGL as a substitute to traditional computer memory, with parallel SGL scenarios working not so “on” this world but rather “within” it in a spatial self-propagation and self-matching manner. This mode of virus-like spatial processing allows for agile and ubiquitous dealing with arbitrarily large networked spaces, proving particularly efficient for distributed HT systems representing human societies.

SGL worlds. SGL directly operates with:

• Virtual World (VW), which is finite and discrete, consisting of nodes and semantic links between them, both nodes and links capable of containing any information, of any nature and volume.

• Physical World (PW), infinite and continuous, where each point can be identified and accessed by physical coordinates expressed in a proper coordinate system, with the precision given.

• Execution World (EW), consisting of active doers with communication channels between them, where doers may represent humans, robots, laptops, smartphones, any other devices or machinery capable of operating on the previous three worlds.

Different combinations of these worlds can also be possible in SGL, for example, Virtual-Physical World (VPW) allowing not only for a mixture of the both worlds but also their deeper integration where VW nodes can be associated with certain PW coordinates, thus making their presence in physical reality too. Another possibility is Virtual-Execution World (VEW), where doer nodes may be associated with virtual nodes like having special names assigned to them, having now semantic relations between them too. Physical-Execution World (PEW) can pin some or all doer nodes permanently to certain PW coordinates, and Virtual-Physical-Execution World (VPEW) can combine features of the previous variants.

SGL structure. SGL has a recursive structure shown in Fig. 5.

The SGL topmost definition, with scenario in it named a *grasp*, is as follows:

grasp → *constant* | *variable* | *rule* ({ *grasp*, })

with syntactic categories shown in italics, vertical bar separating alternatives, braces indicating repetitive parts with the delimiter shown at the right, and parentheses and comma being the language symbols.

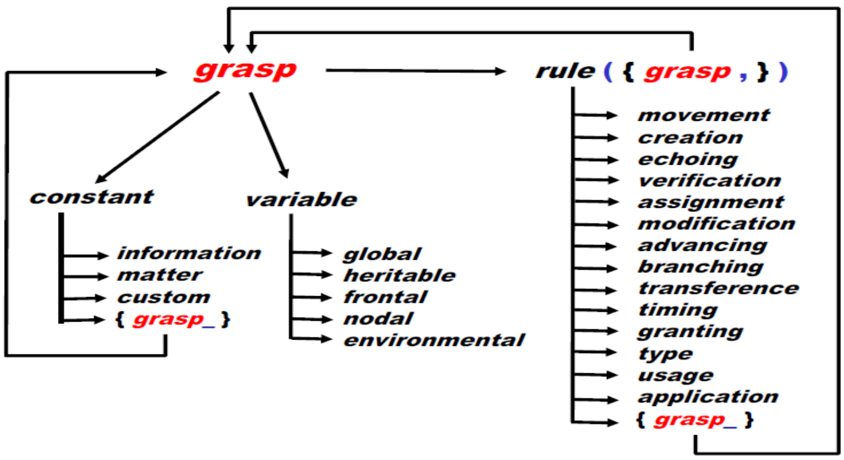


Fig. 5. SGL recursive organization

From this notation, an SGL scenario (applied in a certain world point, i.e. of PW, VW, EW or their combinations) can be:

• A constant defining the result explicitly.

• A variable containing data assigned to it previously (for example, by another scenario).

• Or, recursively and parenthesized, as one or more grasps (which may be just constants or variables as above, in the simplest case) preceded by a rule.

SGL rules. The rules, starting in the current world positions, can be of most diverse natures – from local matter or information processing to propagation in different spaces (including their creation or modification) to local or global management and control. Rules can produce results which may be single or multiple, and in the same or other world locations. The results and positions obtained, in turn, may serve as operands and starting points for other, higher-level rules leading to new results and new positions, and so on. Rules classify as follows.

rule → *movement* | *creation* | *echoing* | *verification* | *assignment* | *modification* | *advancing* | *branching* | *transference* | *timing* | *granting* | *type* | *usage* | *application* |{ *grasp_*}.

The final option, *grasp* again (single or aggregated), brings another level of recursion into SGL where the very names of operations can themselves be results of spatial development of arbitrary SGL scenarios.

SGL constants. The constants can represent information, physical matter (objects), custom defined items for specific applications or, recursively, arbitrary structures in the grasp syntax (aggregated grasps including):

constant → *information* | *matter* | *custom* | { *grasp_* }.

SGL variables. Often called "spatial", they may contain information or matter, associate with different positions of distributed worlds moving in between them, and belong to the following types: *global* (stationary or mobile), heritable (stationary), frontal (mobile), environmental (stationary or mobile), and nodal (stationary), as follows:

variable → *global* | *heritable* | *frontal* | *environmental* | *nodal*.

Control states and their hierarchical merge. The following states associate with different steps of scenario evolution in distributed space-time continuum, effectively supporting the integral spatial control of multiple sequential and parallel processes:

• `thru` – reports full success of the current scenario branch with next scenario steps, if any, allowed to proceed further from the current step;

• `done` – indicates success of the current step but blocks further development of this branch (unless this is explicitly changed by higher-level rules);

• `fail` – signals non-revocable failure of the current branch, without possibility of further development;

• `fatal` – reports terminal, nonlocal failure triggering abortion of all evolving processes and associated data. The scope of this cancellation process may be supervised by a special rule at higher levels.

These states appearing in different branches of parallel and distributed scenario are used to obtain generalized control states at higher scenario levels for making proper decisions. The hierarchical bottom-up merge & generalization of states is based on their values, with stronger states always dominating (from the strongest to weakest: `fatal`, `thru`, `done`, `fail`).

The use of conventional notations. To shorten SGL programs, abbreviations of operations and delimiters of traditional programming languages can sometimes be used too, substituting certain rules, with the overall scenario structures, however, obeying the one shown in

Fig. 5.

Some elementary examples in SGL, as follows.

- Just representing the result directly, as a numerical, string, or custom constant:

`77, 'Peter', Peter.`

- Assigning the sum of values to variable Result:

`assign(Result, add(27,33,55.6))` or `Result = 27+33+55.6.`

- Moving to two physical locations (x1, y3) and (x5, y8) in parallel:

`move(location(x1,y3), location(x5,y8))` or `move(x1_y3, x5_y8).`

- Creating isolated virtual node Peter:

`create(node(Peter))` or just `create(Peter).`

- Extending node Peter as “father of Alex”, the latter to be a new node:

`hop(Peter); create(+fatherof, Alex).`

- Tasking doer D1 (human or robot) to shift in space by coordinate deviation (dx, dy):

`hop(D1); WHERE += dx_dy.`

3.3. Distributed SGL Interpreter

The internal organization of SGL interpreter (which may be in software, hardware or both) is shown in Fig. 6). The interpreter consists of a number of specialized modules working in parallel and handling & sharing specific data structures supporting both persistent virtual worlds and temporary data and hierarchical control mechanisms.

The backbone and nerve system of the distributed interpreter is its dynamic spatial track system with its parts kept in the Track Forest memory of local interpreters. These are logically interlinked with similar parts in other interpreter copies forming altogether global control coverage. This forest-like distributed track structure enables for both hierarchical and horizontal control of multiple processes as well as remote data and code access, with high integrity of emerging parallel and distributed solutions achieved without any centralized resources.

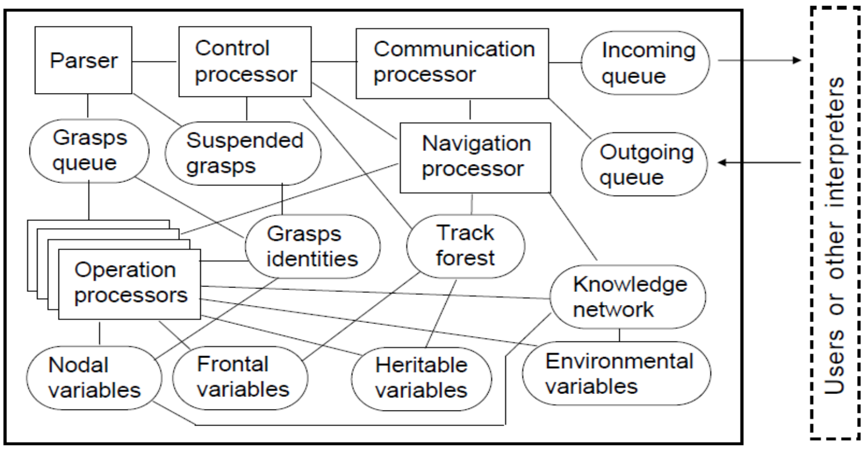


Fig. 6. Organization of SGL interpreter

The dynamically crated track trees (forests) spanning the systems in which SGL scenarios evolve are used for supporting spatial variables and echoing & merging control states and remote data. They are self-optimizing in parallel echo processes while providing automatically of what is usually called (adaptive) command and control. They also route further grasps to the positions in physical, virtual, execution or combined spaces reached by the previous grasps, uniting them with frontal variables left there by preceding grasps.

The whole network of the interpreters can be mobile and open, changing at runtime the number of nodes and communication structure between them. Copies of the interpreter can be concealed if operate in hostile environments, allowing the latter to be analyzed and impacted in stealth manner.

The dynamically networked SGL interpreters are effectively forming a sort of a universal parallel spatial machine capable of solving any problems in a fully distributed mode, without special central resources. “Machine” rather than computer as it can operate with physical matter too and can move partially or as a whole in physical environment, changing its shape and space coverage. This machine can operate simultaneously on many mission scenarios which can be injected into it at any time and from arbitrary nodes.

4. Exemplary Human Terrain Operations

Some typical intelligence-related tasks on human collectives are shown here programmed in SGL in parallel and fully distributed mode by navigating social networks via local links between human nodes, potentially starting from any node. On the results obtained, a needed impact may be launched, say, for disaster relief, tracing moving national and international suspects, outlining and blocking terrorist groupings and centers, or special support of elderly population. The SGL interpreters can be installed everywhere and in huge numbers: in mobile phones, laptops, video cameras, internet hosts, etc., and this installation can be accomplished by consensus or in a stealth manner, say, within special (legal, of course) programs.

4.1. Distributed Counting of the Number of Nodes and Links

Exemplary HT network model (as in Fig. 7) with human nodes uniquely numbered from 1 to 10 and different relations between them (as r1 to r4), which can be repeating.

Counting the number of all HT nodes. Counting number of all nodes can be performed by the following elementary program starting in any node and operating in a distributed way by spatially navigation the network:

```
Nodes=count(hop(nodes, all))
```

Result obtained in the starting node: Nodes ==10.

Counting the number of all HT links. Can be accomplishes by:

```
Links=count(hop(nodes, all); hop(links, all))/2
```

Result in the starting node: Links ==14.

Finding the node with maximum number of links (as node 3 in Fig. 8).

It may be assumed that the leader of a group of interconnected individuals has maximum number of semantic links with other group members, and such node can be found by:

```
Leader =
   element(max(hop(node,all); count(hop(link,all))& NAME),2)
```

Obtained result in any starting node: 3.

4.2. Finding Paths Between Nodes

All paths between given nodes. Let us find all paths between particular nodes, let them be 1 and 6 (see Fig. 9).

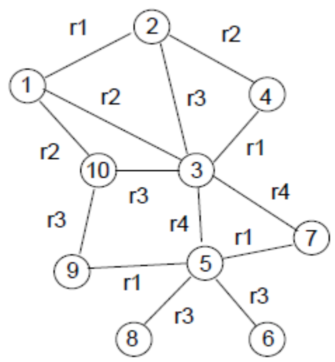


Fig. 7. Exemplary human terrain

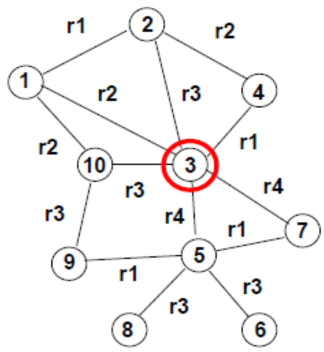


Fig. 8. The node with maximum number of links

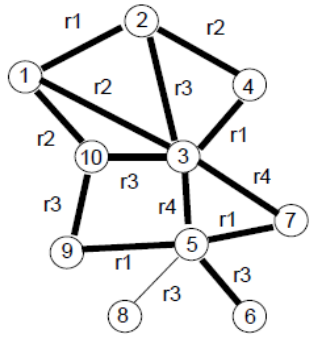


Fig. 9. All paths between nodes 1 and 6

These may, for example, hint via which (non-repeating) individuals you can potentially reach a person from another person by using local relations between human nodes in their HT network. The corresponding SGL scenario, starting in node 1, will be as follows:

```
AllPaths=(frontal(Path); hop(1);
repeat(notbelong(NAME,Path);
       append(NAME,Path);
       if(NAME=6,done(Path), hop(links,all))))
```

All results accumulated in the starting node will be as follows:

All Paths == (1, 3, 5, 6), (1, 2, 3, 5, 6), (1, 2, 4, 3, 5, 6),
(1, 3, 7, 5, 6), (1, 2, 3, 7 ,5, 6), (1, 2, 4, 3, 7, 5, 6),
(1, 10, 3, 5, 6), (1, 10, 9, 5, 6), (1, 10, 3, 7, 5, 6),
(1, 3, 10, 9, 5, 6), (1, 2, 3, 10, 9, 5, 6), (1, 2, 4, 3, 10, 9, 5, 6).

All paths between given nodes via particular links. Let again the nodes be 1 and 6, and the allowed links between them as r2, r3, r4 (say, of friendship or acquaintance), see Fig. 10.

This details the previous task by explicitly naming links which should be passed between nodes on the way to the target node.

```
AllPaths=(frontal(Path); hop(1);
repeat(notbelong(NAME,Path);append(NAME,Path);
       if(NAME=6, done(Path), hop(links(r2,r3,r4)))))
```

The result returned to the starting node 1 will be as:

All Paths == (1, 3, 5, 6), (1, 10, 3, 5, 6).

Shortest path tree (SPT) covering all nodes. Such a tree, starting from node 1, is shown in Fig. 11.

The following program creates one of possible shortest path trees, starting from the given node and covering all other nodes. In a networked human terrain this may allow us to reach all other persons from a certain person via local relations between them in a quickest way.

```
hop(1); frontal(Length)=0;
repeat(or(Distance==nil, Distance > Length);
       Distance = Length; Previous = BACK;
       increment(Length, 1); hop(links, all))
```

SPT will be recorded directly in the network structure by using nodal variables Previous associated with each node (pointing at the predecessor node in the tree).

Shortest path between nodes based on the SPT built. Using the created SPT allows us to easily fix shortest path between its root in node 1 and any other node (see Fig. 12).

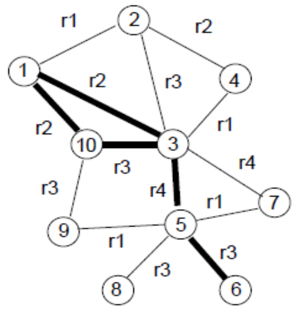


Fig. 10. All paths between nodes 1 and 6 via links r2, r3, r4 only

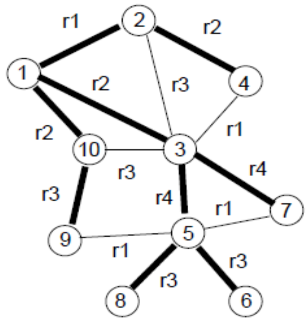


Fig. 11. Possible shortest path tree from node 1

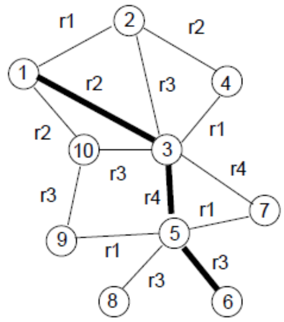


Fig. 12. Fixing shortest path between nodes using the SPT built

Fixing shortest path between nodes 1 and 6 using the created SPT, starting in node 1:

```
hop(1); frontal(Path) = NAME;
repeat(hop(links, all);Previous == BACK; append(NAME, Path);
       if(NAME==6, output(Path)))
```

Result issued in node 6: 1, 3, 5, 6. With elementary modification the result may be in node 1 too.

4.3. Finding Weakest, or Articulation, Points

Example of such a node splitting the system into disjoint pieces when deleted is shown Fig. 13.

These nodes may be particularly important, say, for the strictest dealing with adversary’s systems by just removing (or negotiating with) the most sensitive points (individuals) in them. The SGL solution for all articulation points in the HT network:

```
hop(nodes,all); COLOR = NAME;
and((hopfirst(rand(link,any)); repeat(hopfirst(links,all))),
    hopfirst(links,all), output(NAME))
```

Output issued in the single articulation point found: 5.

Such points found can also be used, for example, for strengthening weak issues in national or international affairs, by adding new relations between other nodes (see Fig. 14) as follows:

```
hop(9); linkup((r5, 8); (r6, 6); (r7, 7))
```

4.4. Finding Strongest Subnetworks, or Cliques

Two such graph substructures (from total four, here all triangles) are shown in Fig. 15.

Below is parallel and fully distributed solution of finding such strongest parts of a network, where each node has relations with each other node, and these fully interconnected parts are maximum possible by the number of their nodes.

```
hop(nodes, all); frontal(Clique) = NAME;
repeat(hop(links, all); notbelong(NAME, Clique);
       if(andparallel(hop(link(any), Clique(all))),
          if(BACK < NAME, append(NAME, Clique), done),
          fail));
if(length(Clique) >= 3, output(Clique))
```

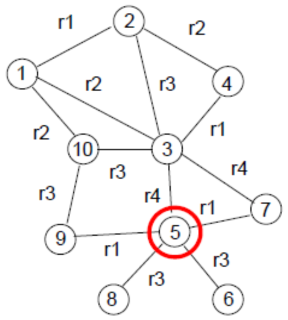


Fig. 13. Articulation point of the network

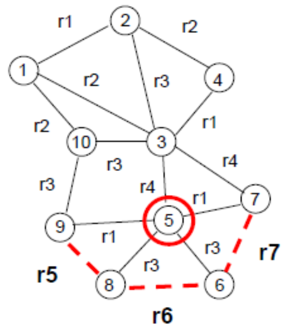


Fig. 14. Strengthening the network by adding new relations between nodes

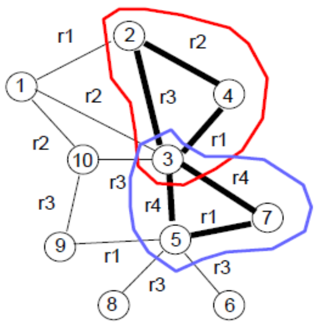


Fig. 15. Examples of cliques in the network

The result issued in the last nodes of the cliques found:

(1, 2, 3), (1, 3, 10), (2, 3, 4), (3, 5, 7).

If to speak of adversaries, cliques may be the most powerful and therefore dangerous groupings in their organizational structures which should be analyzed and dealt properly, say, by negotiating with or removal all or some of them (see Fig. 16 with a single clique 2, 3, 4 deleted). The following program will be sufficient for the latter: `remove(nodes(2,3,4)).`

4.5. Finding Arbitrary Structures in Human Terrain

It is possible to describe in SGL any graph pattern reflecting any possible situation in distributed social systems (with variables at both nodes and links) and organize its parallel and fully distributed matching with the networked system, even worldwide, with an example of such a pattern and its two matches (formally four, due to the pattern's symmetry) shown in Fig. 17.

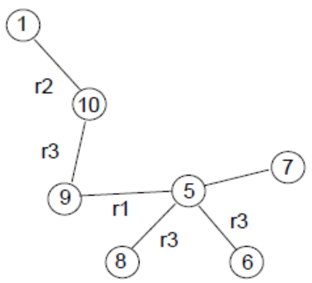


Fig. 16. Removing one of the cliques found

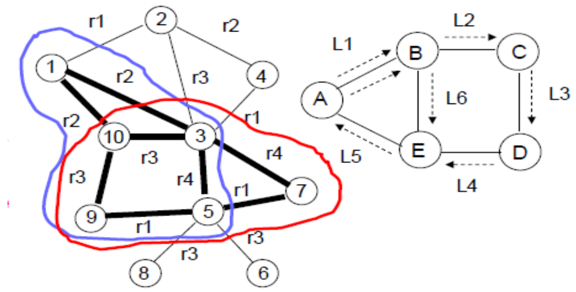


Fig. 17. Finding matching of arbitrary graph pattern

Different strategies for representing arbitrary graph patterns (which may have alternatives and can also be fuzzy) are possible in SGL, with simplest ones based on a path through all their links or nodes. By using a path via all pattern nodes, the matching scenario will be as follows.

```
hop(nodes,all); frontal(Match) = NAME;
4(hop(links,all); notbelong(NAME,Match); append(NAME,Match);
if(andparallel(hop(link,any),nodes(Match(1,2))),output(Match).
```

Answer for the pattern variables (A, B, C, D, E) with pattern's formal four-times match:

(1, 3, 5, 9, 10), (1, 10, 9, 5, 3), (7, 5, 9, 10, 3), (7, 3, 10, 9, 5).

A great variety of possibilities for finding arbitrary spatial patterns (therefore situations) in distributed HT networks exist in SGL, where patterns may be with named links and nodes, having dynamic, alternative, hierarchical, and fuzzy structures, etc.

4.6. Finding Spatial Center of an Organization

As mentioned before, the networked human terrain model has both virtual and physical dimensions, where nodes may have registered physical coordinates too. Using the latter, we may get general impression about the physical area occupied by the HT network, or any other features, for example, the averaged topographical centre of the HT (see Fig. 18). The following SGL program finds physical centre of the distributed HT network, issuing result in the node started.

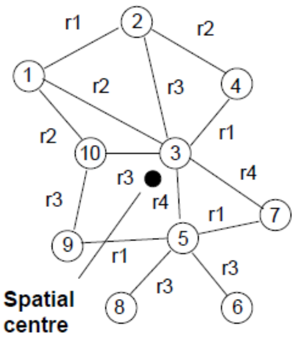


Fig. 18. Averaged spatial centre of HT network

```
output(average(hop(nodes, all); WHERE))
```

Distance between centers of different organizations. This can base on the previous task of finding physical center of HT organization. We can first find centers of distributed (generally spatially overlapping) organizations by given types of links between their individuals (say, by ideologies or religions pursued) and then determine the distance between these centers of weight, which may hint, for example, on possibility of emergence of violence between the communities.

5. Other Human Terrain Tasks

We have shown above only simplest cases of using SGT and SGL for analyzing and impacting human terrain based on its networked representation. The scenarios presented can work in large distributed HT spaces in highly parallel and fully distributed mode, without central control, with communicating sensors empowered by SGL interpreters embedded in human societies in large numbers (thousands to millions to billions). The following are examples of some more complex problems currently being investigated with the use of SGT.

- Runtime tracing and analyzing individuals moving through human terrain by mobile intelligence provided by SGT.
- Investigating critical infrastructures and key resources in SGT with subsequent governmental response to asymmetric situations.
- Providing global and selected situational awareness by self-matching and self-recovering spatial intelligence in SGT.
- Classifying and discovering terrorist suspects and organizations, Black Spots [30] including.
- Investigating the spread of ideas in human societies leading to massive violence and crime.
- Investigating ethnical, cultural, and religious origins of conflicts between populations.
- Providing robustness and agility of distributed human terrain-based systems.
- Analysing influence of links between geographical and human terrain on world dynamics.
- Using advanced unmanned systems for collecting smart data related to human terrain.

6. Conclusions

Human Terrain research and practice can and should be considered and used in a much broader sense and scale than originally planned, allowing us to solve complex national and international conflicts and problems by intelligent and peaceful means, fully obeying ethical standards. The high-level networking ideology, model and technology described in the paper can put this promising trend into real life, helping us to save lives and wealth and prevent dangerous conflicts.

SGT is operating in large networked spaces in parallel and fully distributed mode, without central resources, providing robustness and agility to the systems where it can be installed. Being mobile and interpreted at runtime, the technology can self-recover from indiscriminate damages, always fulfilling mission objectives. It can be used for distributed live analysis and control of large human terrain systems or interactive simulation of them, also any combination of the two.

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Стаття надійшла до редакції 14.07.2015