Perception based Object Recognition using SP Theory

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Abstract—Object recognition is a process of detecting the object present in an image or a video sequence, with the help of some recognition technique or methods. Object recognition is one of the techniques of digital image processing where we can process any image by applying some of the operation. This paper is about how the SP theory of intelligence and its realisation in the SP machine may help in the design of the 'brains' of autonomous robots which can detect and recognize objects based upon their perception, meaning robots that do not depend on external intelligence or power supplies, are mobile, and have human-like versatility and adaptability in intelligence

Keywords— Sp theory, Object detection

I. INTRODUCTION

Artificial is an area which emphasizes on generating intelligent machines that work and react like humans. It is also the name of the academic field of study which studies how to create computers and computer software that are capable of intelligent behavior. The scientific goal of AI is to understand the principles that make intelligent behaviour possible in natural or artificial systems.

The central problems of AI research include reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects.[1] General intelligence is still among the field's long-term goals. Currently popular approaches include statistical methods, computational intelligence and traditional symbolic AI. There are a large number of tools used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics, and many others. The AI field is interdisciplinary, in which a number of sciences and professions converge, including computer science, mathematics, psychology, linguistics, philosophy and neuroscience, as well as other specialized fields such as artificial psychology.

Object reorganization
To understand the concept of object reorganization, it's necessary to have knowledge about image. Image is a two-dimensional signal and it may be pictured mathematically as F(x, y) wherever x and y square measure 2 coordinates, horizontally and vertically. Actually, the actual purpose i.e. F(x, y) is that the price of the picture element. The terribly basic term includes in a picture may be a picture element i.e. a smallest component constitutes in a picture and also the purpose F(x, y) represents the actual price of the picture element. [1] picture element will store a price that's proportional to the intensity of the sunshine at a specific location.

SP theory
Simplicity and Power (SP) theory, compress's the given data thus reduces the information redundancy and leads to increasing "Simplicity" of data whilst retaining as much as possible of its non redundant expressing "Power". It aims to provide a general-purpose "intelligence"—chiefly the multiple alignment framework—and thus save the need to create those kinds of mechanisms repeatedly in different AI applications.

II. SP THEORY OF INTELLIGENCE

The SP theory of intelligence is designed to simplify and integrate observations and concepts across artificial intelligence, mainstream computing, mathematics, and human perception and cognition, with information compression via multiple alignment as a unifying theme. It is realised in the SP computer model which may be regarded as an early version of the SP machine.
The main elements of SP theory
1. All knowledge is expressed as patterns.
2. All processing is done by compression of information.
3. Probabilities may be calculated.
4. 'Multiple alignment' is a powerful central idea.
5. The SP theory realised in the SP70 computer model.
6. Patterns may be realised in a modified version of Hebb's cell assembly concept.

An important part of this process is, where possible, the economical (compressed) encoding of New patterns in terms of Old patterns. This may be seen to achieve such things as pattern recognition, parsing or understanding of natural

language, or other kinds of interpretation of incoming information in terms of stored knowledge, including several kinds of reasoning.

This paper is regarding however the SP theory of intelligence and its realization within the SP machine could facilitate within the style of the information-processing 'brains' of autonomous robots. Here, 'autonomous robots' are ones that don't rely on external intelligence (natural or artificial), don't rely on external power provides, and are mobile. We tend to shall additionally assume that a goal in their development is to produce them with human-like skillfulness and adaptableness in intelligence.

The paper has relevancy to robots that don't seem to be autonomous within the sense simply represented, however the issues to be addressed are most acute in robots that ar supposed to perform autonomously, and potential solutions ar correspondingly additional attention-grabbing.

In brief, the issues and potential solutions to be mentioned are:

- Computational potency, the employment of energy, and therefore the size and weight of computers. If a golem is to be autonomous within the sense printed on top of, it wants a brain that's economical enough to try to all the mandatory process while not external help, doesn't need AN industrial-scale power plant to fulfill its energy demands, and is little enough and light-weight enough to be carried around easily—things that are tough or not possible to realize with current technologies. The SP system could help: by reducing the dimensions of knowledge} to be processed; by exploiting applied mathematics information that the system gathers as AN integral a part of however it works.

- Towards human-like skillfulness in intelligence. If a gole is to work with success in an atmosphere wherever folks cannot facilitate, or wherever such opportunities ar restricted, it wants the maximum amount as attainable of the flexibility in intelligence that folks could otherwise give. The SP system demonstrates skillfulness via its strengths in areas like unattended learning, linguistic communication process, pattern recognition, data retrieval, many varieties of reasoning, planning, downside finding, and more. however the SP system isn't merely a accumulation of various AI functions. as a result of its specialization in simplification and integration of ideas in computing. It guarantees to scale back or eliminate unnecessary quality and to avoid awkward incompatibilities between poorly-integrated subsystems. And like all theory that simplifies and integrates an honest vary of observations and ideas, it guarantees deeper insights and higher solutions to issues than could preferably be achieved.

- Towards human-like ability in intelligence. Amongst the AI capabilities of the SP system mentioned on top of, unattended learning has specific significance due to its potential as a key to human-like ability in intelligence, each directly and as a basis for other forms of learning.

The SP theory is accomplished within the kind of a pc model, SP70, which can be considered a primary version of the SP machine. Expressing the speculation within the kind of a pc model helps to scale back unclearness within the theory. maybe additional significantly, it provides a way of testing candidate ideas. As results of such testing, several seemingly-promising ideas are rejected. The model is additionally a way of demonstrating what are often achieved with the system. it's envisaged that the SP pc model are going to be the premise for the creation of a high-parallel, ASCII text file version of the SP machine, hosted on AN existing superior pc. this can be a way for researchers everyplace to explore what are often through with the system and to form new versions of it.
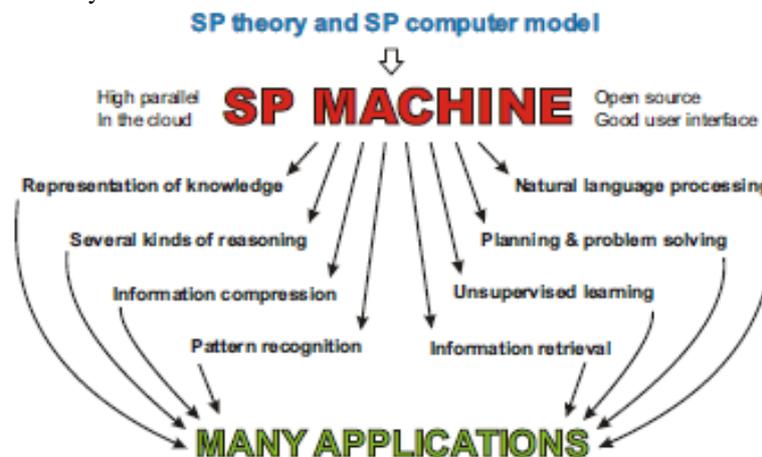

Fig 1: Schematic representation of the development and application of the SP machine.[1]

In the SP system, data is pictured with arrays of atomic symbols in one or 2 dimensions referred to as patterns. A 'symbol' within the SP system is solely a mark which will be matched with different other images to see whether or not it's constant or different: no other result's allowable. With one exception, any which means related to a given SP image or combination of symbols should be expressed mistreatment different SP symbols. The exception is wherever AN SP image connects with an entity or price outside the SP system. for instance, a symbol from a sensing element in an autonomous mechanism, or an instruction for one amongst the robot's muscles to contract, is also pictured by a logo at intervals the SP system.

The SP theory is formed as a brain-like system that receives New info via its senses and stores some or all of it in compressed type as previous info. The default assumption within the SP theory is that compression of data is usually lossless, which means that every one non-redundant information is maintained.

In the SP system, info compression is achieved via the matching and unification of patterns. a lot of specifically, it's achieved via the building of multiple alignments and via the unsupervised learning of grammars. These 3 things square measure delineate in brief within the following 3 subsections.

1) info Compression Via the Matching and Unification of Patterns: the premise for info compression within the SP system could be a method of finding out patterns that match one another with a method of merging or 'unifying' patterns that square measure constant.

2) info Compression Via the Building of Multiple Alignments: That method for locating smart full and partial matches between sequences is that the foundation for processes that build multiple alignments.

3) info Compression Via the unsupervised Learning of Grammars: the SP system could, while not help from a "teacher" or something equivalent, derive one or a lot of plausible grammars from a body of latest patterns, with minimum length secret writing as a tenet. in this method, multiple alignment features a central role as a supply of SP patterns for doable inclusion in any synchronic linguistics.

4) Heuristic Search: Like most issues in computing, every of the afore-mentioned problems—finding smart full and partial matches between patterns, finding or constructing smart multiple alignments, and inferring one or a lot of smart grammars from a body of data—is usually too complicated to be resolved by thorough search.

Applications of SP theory:
- Conceptual simplicity combined with descriptive and explanatory power across several aspects of intelligence.
- Simplification of computing systems, including software.
- Deeper insights and better solutions in several areas of application.
- Seamless integration of structures and functions within and between different areas of application.

Drawbacks of SP theory
- While performing matching of patterns of images in SP theory , it takes more time. As elapsed time for process of matching of patterns is large. Owe to more elapsed time for matching of patterns of images latency occurs which leads to work load on system.
- SP theory follows divide and conquer rule which generate a problem for parallel streams of data. Also it should be assisted by the creation of a high-parallel, open source version of the SP machine, available to researchers throughout the world to examine what can be done with the system and to create new versions of it
- The SP system has potential for substantial gains in computational efficiency, with corresponding cuts in energy consumption and in the bulkiness of computing machinery.
- The SP theory should facilitate the integration of structures and functions, both within a given area and amongst different areas—a likely pre-requisite for the achievement of human-like versatility and flexibility in the way computers work .
- The potential benefits and applications are not merely of theoretical interest. If, as a conservative estimate, they were to add 5% to the value of annual worldwide IT investments , they would be worth $190 billion each year, and increasing with the continuing growth of IT.
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III. CONCLUSION

It is unfeasible to think about one methodology for all sort of pictures even by exploitation SP theory of intelligence for robots based mostly upon perception, nor will all strategies perform well for specific kinds of image. The background subtraction methodology detects object with noise and output isn't correct. Object behind object isn't detected. drawback happens throughout identification of object once any obstacles precede the thing. If the position of camera isn't correct and object in image isn't captured properly then it can't be known. to resolve higher than issues and produce some accuracy and richness by combining multiple strategies and create use of it along in step with the appliance.

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