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Tunable Computing Environment for Slam Navigation

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Abstract - The problem of building high-performance systems is considered, as well as the development of mathematical models of such systems for mobile robotic navigation. We consider the general situation of 3D mapping for SLAM in the modern world, and also show the results of our work.

Keywords: rebuild computional environment, high-performance computing system, octree.

1. Introduction:

Nowadays, the simultaneous localization and mapping approach (SLAM) has become one of the most modern technical methods used for mobile robots to create maps in unknown or inaccessible places. Update maps to a specific area while tracking your current location and distance. We built a highly structured system using mathematical models in conjunction with the Octomap environment to navigate a mobile robot.

2. SLAM

In robot mapping and navigation, simultaneous localization and mapping (SLAM) is one of the issues that scientists and the world are interested in computation for creating or updating maps. An undefined environment also tracks the location of an internal agent. To overcome and improve positioning in short distances, synchronization and simultaneous integration (SLAM) has made remarkable progress in the development of science and technology.

3. Octomap

Some robots applications require a three-dimensional model of the environment. Although 3D maps are an integral part of many robotic systems, there are still a few flaws that are rarely deployed in a system with reliability and efficiency. The absence of such implementations leads to the reproduction of basic software components. Therefore, it can be considered an important point in the study of robots.

4. High-performance reconfigured systems

In recent years, instead of using small and medium-sized microchips, people have switched to software logic devices, followed by large integrated circuits that are used as computer cores on industrial computers or in programmable logic controllers. Automation of decision-making requires the use of advanced mathematical techniques and new technology. The growing interest in the functions of the algebra of logic and its computational problems led to the creation of the theory of homogeneous structures. The paper proposes a logical model that can be adapted to a specific class of Boolean formulas. This model allows us to solve the problem of the computing system of Boolean formulas from ordered and unordered iterative classes, as well as the class of Boolean formulas in the order of repetition and Boolean systems with and without arguments.

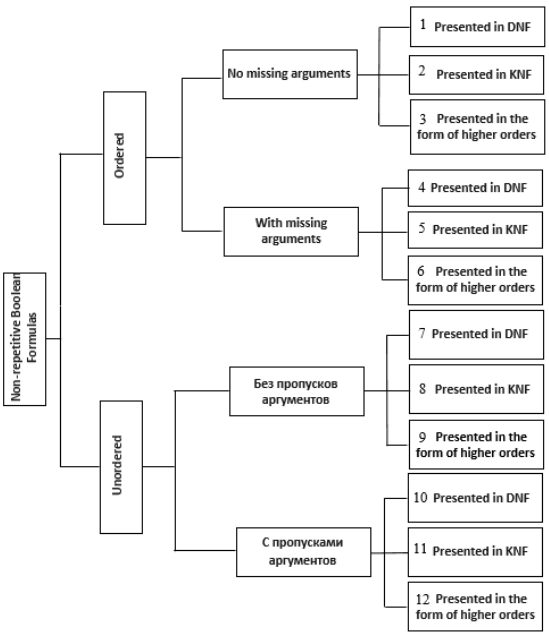

Fig. 1. Classification of non-repetitive Boolean formulas

In this article, we consider the formula in the basis of {AND, OR, NOT}. First, we consider the fully qualified BFU n variables defined on the 2n input sets. The main metric of a BFU is the number of variables n. In principle, the boolean formula is divided into two groups, non-repeat and repeated. The classification of non-repeat BF reduction in Fig.1.

In accordance with the above classification (see Fig. 1), the set of Boolean formulas splits into pairwise disjoint classes — sets of the same type of formulas. Each formula of a particular class can be chosen as a representative of this class. Boolean formulas belonging to one class are realized by physically identical schemes, therefore for each class it is enough to implement only one scheme, the structure of which is described by the formula of a representative of a class. We synthesize such an automaton, which will provide, at a certain setting, the calculation of all the BF groups provided in Fig. 1, while the input arguments are not the same.

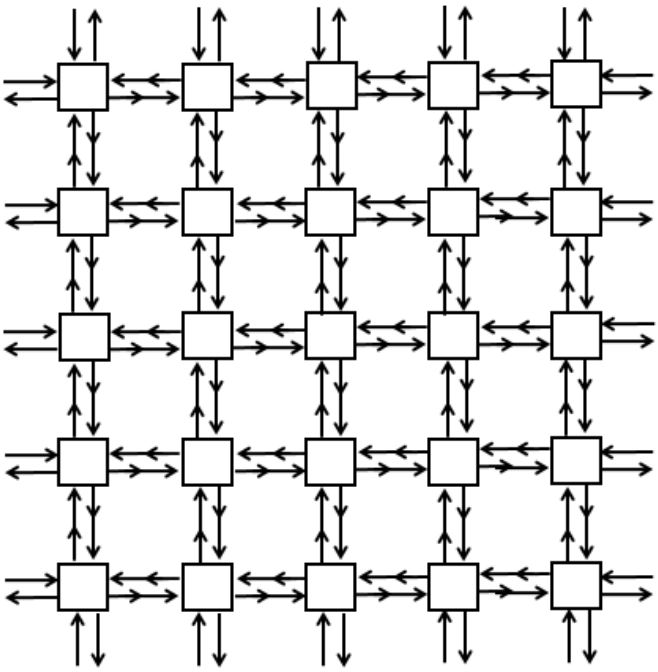

Fig.2: Environment after adjusting for Octree

We will rebuild in Octomap environment. The octree for the window is an elementary computation. Therefore, I built this formula:

$$\begin{cases} f_1 = x_1 \vee x_2 \vee x_3 \vee x_4 \vee x_5; \\ f_2 = x_1; \\ f_3 = x_1; \\ f_4 = x_1 \end{cases}$$

as where x1 - x4 are fed data from a cloud of points. The overall picture (Fig. 2) looks like matrices.

5. **Conclusion**:

This article used a point cloud to create an octree. The results show that when using uniformly structured models and parallel processing, the results and implementation time of the algorithm are faster at each stage of performing image processing tasks in three dimensions. This is such an environment that allows you to very quickly build a map based on the octree. And SLAM octree has specific features. We directly choose and play specifically to solve this problem. Creating a more computationally competitive computing environment is a good result and a good condition. That is the context to continue to study.

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Research method detection human face in video streams

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Human face recognition is a field of study in the field of computer vision. Face recognition methods are now divided into different directions according to different criteria. Research article on face detection techniques in video streams, using the OpenCV library.

Keyword: face dectection, face recognize, feature based, feature extractrion.

1. Introduction

The face recognition has a rich data source and requires less controlled interaction and can be found in real life as well as data on the net. It's method is also divided into several directions: Identification with input data is a 2D still image (is most popular), but the future will probably be 3D FR (because, if layout of many 2D cameras will give the data in kind of 3D and deliver better, more reliable results) can also be divided into two directions: to do with image data and to do with video data. In reality, people divide the face recognition methods into three categories: global approaches, such as Eigenfaces-PCA [1], Fisherfaces-LDA [2]), based on local feature based (LBP, Gabor wavelets [3]) and hybrids (a combination of two global and local features). Local-based methodologies have been proven to be superior in working under uncontrolled data conditions. It can be said that the development history of human face recognition is the development of selective extraction methods used in image feature extractrion systems. Specific applications of face recognition are based on two identification models: identification (1-N problem), and verification (problem 1-1). In the identification problem, we need to determine the identity of the test image, but in the verification problem, we need to determine whether the two images belong to the same person.

2. Phases in a face recognition system

To build a face recognition system, it is not easy. The first step is "face detection" - it means detecting the image in the input (image database, video ...) and cut the face to perform the identification. The second step is "image preprocessing" including image alignment and normalization (here we referring to straight-line images). The third step is "character selection". In this step, a method of extracting certain characteristics (LBP, Gabor wavelets, [4] ...) will be used with the facial image to extract image specific information. As a result, each image is represented as a feature vector; the next step is the identification or classification step, Identification or label of the image - that is the image of the one. At the classification step, usually the method k-nearest neighbor (k-NN) [5] will be used, in practice the use of Support Vector Machine [6]) does not bring worse results.

Data for a face recognition system is divided into 3 volumes: training set, reference set, and set for identification. In many systems, the training file is identical to the reference file. The training set consists of images used for training, usually used to generate a projection subspace as a matrix and the commonly used method is Principal Component Analysis (PCA) [7], Whitened PCA (WPCA), Linear Discriminant Analysis (LDA) [8],