Design of Interactive Learning System Based on Intuition Concept Space

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***Abstract*—The theory of intuition learning is briefly reviewed and a model of the learning process is presented. The paper then discusses and characterizes an Interactive Intuition Learning System (IILS) and its relationship to experiential learning and learning pattern. From the initial intuition decision system defined by the experience judgment, a series of learning interval-systems with various experience levels are created. Firstly, human intuitive decision making gotten by the learning approach of self-organization of intuition decision processing, and the concept mapping of selection of knowledge and experience is established by artificial intuition method based on the decision trait of human intuition. Finally, an artificial intuition method combined with self-organization method of intuition computing is proposed according to the amelioration of the intuition computing. Experiment proves that the Intuition Concept Space and the interactive mapping intuition pattern inversion (IMIPI) approach are feasible. A prototype for a intuition learning environment designed and built by the author is then discussed along with its application in the design of a crime analysis for learning electrical circuits.**

***Keywords*—experiential learning, interactive optimum, IMIPI, intuition concept space, crime knowledge management**

I. INTRODUCTCON

Problem solvers using ‘‘Intuition Learning System (ILS)’’ are applied in many application domains when optimal solutions cannot be found within a reasonable amount of time. By definition, ILS is common sense knowledge that can be used to solve a problem without any guarantee on the resulting performance. Consequently, performance of a problem solver can be affected by the choice of ILS in the problem solver.

At present, most ILS is designed manually based on past experience of their intuition. Since the number of possible Intuition is very large for realistic applications of reasonable complexity, heuristics designed manually may not work well when applied in new problem instances. Further, there is no systematic method to evaluate the effectiveness of ILS designed manually. For these reasons, an automated method for discovering the proper ILS for a particular application is very desirable. This leads to the development of our system for automated learning of intuition [1, 2, 3, 4].

In most previous work in intuition learning for a target application, domain knowledge about the application is required. However, in many real-world applications, such domain knowledge is not available or is extremely difficult to extract. In contrast, our approach for automated intuition learning requires little domain knowledge and can be applied to a wide variety of applications that would not be possible under other circumstances. To operate in knowledge-lean domains, our system can only learn performance related intuition; *i.e.*, only the performance of the problem solver is affected by the choice of different ILS.

This paper describes the intuition learning system, an implementation of our learning strategy. This system can learn high-performance intuition pattern for its target application within given resource constraints, and can determine the scope of generality of the learned intuition. There are three main objectives in the development of this system:

(1) To be a recognition of non-optimum for conducting experiments on the functionalities of various components of our learning strategy;

(2) To be able to learn better intuition for a wide variety of applications and problem solvers;

(3) To be able to learn intuition structured for specific environments.

In Section 2 we give an outline of the design of learning experiments methodology. In Section 3 we describe the overall structure of the interface. We also discuss in rather more detail the key modules and routines contained in the interface. In Section 4 we demonstrate use of the interface in conducting the interactive learning system of a particular queuing model. In Section 5, The IMIPI Application is currently being deployed at the Dalian Police Department (DPD) and the ICMI is undergoing further modifications.

Ⅱ. BACKGROUND AND SIGNIFICANCES

A. Problem solving and Intuition Learning

Problem-solving thus involves two generalizations. First, a selective trial-and error search is made which by necessity can only consider a relatively few possible solutions. The solution is thus a satisfying solution and the search is based on rules of thumb or heuristics. Second, one of the basic heuristics is means–end analysis. Means–end analysis involves three steps. First, the current situation is compared to a goal, and differences

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between them are noted. Second, a memory search is performed to identify an operator which can bring the current situation more in line with the goal. Third, the operator is applied in the hope of getting closer to the goal. Since computers solve problems as humans do using heuristics and means–end analysis, Simon concluded that computers display intelligence, defined as behavior which is appropriate to the goal and adaptive to the environment.

In the past researching of man-made brain, it is the purpose researching in the area that letting computer practice person's decision over some arithmetic. But, the result isn't satisfying. In active penal detective deciding, detectors judge by feeling to give clues in the conditions that the information was definite and limited. What logic ways do we use to describe this question? Is it sign, arithmetic, or rule? See figure1.

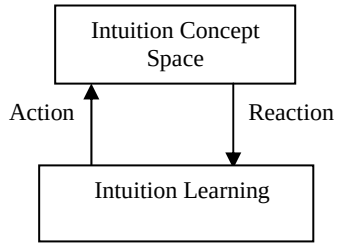

Figure 1. Learning in a intuition concept space

An Intuition Learning (IL) is an adaptive decision making device that learns the optimal action out of a set of actions through repeated interactions with an Intuition Concept Space (ICS) [4]. The Intuition Learning uses the stochastic reinforcement received from the HP to modify its action probability distribution through an Intuition learning algorithm (ILA) [5]. The objective of the ILA is to an action probability distribution that assigns a probability arbitrarily close to unity for the optimal action. Figure.2 shows a block diagram of IL. Thus, we have a learn system of intuition feature come to following Figure 2:

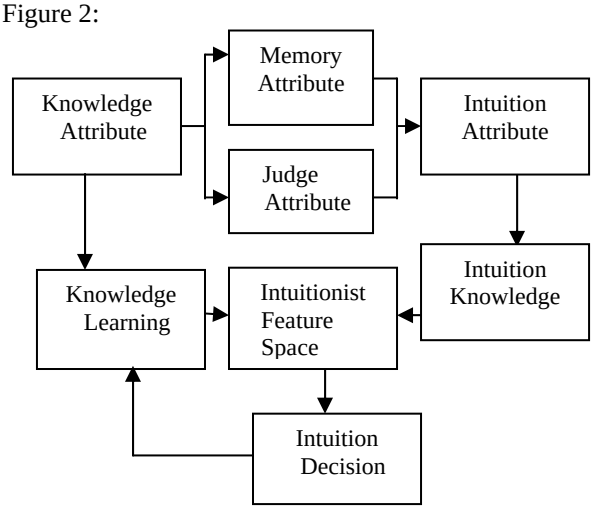

Figure 2. The learn system of intuition feature

After the feature space of intuition is obtained, the next task of the sub-recognition system is intuition attributes classification. Intuition attributes classification of can be viewed as a two-fold task, consisting of learning the invariant and common properties of asset of samples characterizing a class, and of deciding that a new sample is a possible member of the class by noting that it has the features common to those of the set of samples.

B. The Basic Intelligence of Human

There are many different definition of intelligence, but none of them give the answer acceptable by a scientific community. First of all, intelligence is a fuzzy term. In some cases it is very difficult to draw a line between intelligent and non-intelligent natural and artificial systems. For example, biological adaptation or any kind of evolution can be presented as learning intelligent ability or non-intelligent process. It is difficult to determine when expert system became an AI system. All intellectual activities are triggered by the goal. "A system can be intelligent only in relation to a defined goal…" [5].

In fact, there are two components of intelligence: experience-based intelligence (basic intelligence) that is inherited at birth, and knowledge-based intelligence that can be improved by learning. All kinds of intellectual activities in the specific area are based on knowledge, but intelligence is not knowledge. Knowledge is a "tool" of intelligence. If you don't understand a goal, you are not capable to reach it. An ability to learn is an important intellectual ability that can improve knowledge. Knowledge reinforces intellectual activities.

There are three attributes of the recognition to the intelligent system, experience, knowledge and intuition. The attribute of experience reflects the recognition to the characteristics of the basic behavior. The attribute of knowledge reflects the learning recognition to the characteristics of the intelligent behavior. The attribute of intuition reflects the fuzzy dynamic recognition to the characteristics of the intelligent behavior.

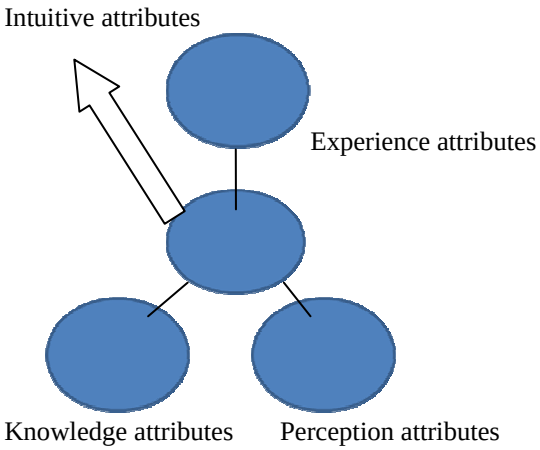

Figure 3. Intuition feature in human activity

People's experience provides basic intelligence for solve many problems. When the recognitions are different, the basic intelligence is different as well. The tracing to the problem's conditions of the past can

propose an experience set. In an artificial system, different people have different behaviors and stories, thus different experiences. Sometimes experiences are called a kind of recognitions; but as the level of recognition is different, the experience of the human is also different. The intelligence of the human is selected and decided by the experience of the human, and the reasonability of the experience's selection is also a meaningful question for discussion.

C. The Experience Learning Based on Optimization

The experience provides Intuition Decision Making (IDM) ns are different; the IDM level is different as well. The tracing to the fuzzy system's conditions of the past can intuition category. In an artificial system, different people have different behaviors and stories, thus different experiences. Sometimes experiences are called a kind of recognitions; but as the level of recognition is different, the experience of the problem is also different. The intuition category of the problem is selected and decided by the experience of the problem, and the reasonability of the experience's selection is also a meaningful question for discussion [3].

Ever since nearly half a century, the optimum theory has undoubtedly contributed extensively every branch of science and technology. It is because of its wide use that people find out it is far from actual requirements. People wonder whether ideal model analysis can solve real problems. Furthermore, it is very hard to build up a mathematic model for many of the actual complicated problems. Especially when the system is uncertain, man can only limply build up the model, but can hardly get its solution. Although there are a lot of approximate methods and theories of solving, they are far from satisfaction [8].

To decide whether an IDM system is an optimal system is the key to analyze it. The aim of analyzing and researching systems of different realms is to find out the best goals and results of the system. However, it is not always that easy. The previous system analysts committed that it is impossible to realize optimum under a limited condition of time and resources. At the same time, behind the optimum, there is definitely a series of hypotheses, middle-way decisions, and predigesting of data. Under most conditions, the hypotheses of optimum do not exist. Although people have generalized this method to many fields, the results obtained can be only temporary, and sometimes cannot achieve the final goals.

The word "heuristic" comes from Greek and means "to know", "to find", "to discover" or "to guide an investigation". Specifically, "Heuristics are techniques which seek good (near-optimal) solutions at a reasonable computational cost without being able to guarantee either feasibility or optimality, or even in many cases to state how close to optimality a particular feasible solution is."

Heuristic refers to any techniques that improves the average-case performance on a problem-solving task but does not necessarily improve the worst case performance. Heuristic techniques search the problem space "intelligently" using knowledge of previously tried solutions to guide the search into fruitful areas of the search space. Often, search spaces are so large that only heuristic search can produce a solution in reasonable time. These techniques improve the efficiency of a search process, sometimes by sacrificing the completeness or the optimality of the solution. Heuristics are estimates of the distance remaining to the goal, estimates computed based on the domain knowledge.

III. INTUITION LEARNING BASED ON INTERACTIVE OPTIMUM

A. Interactive Optimum Method

Although humans can solve many problems, they are functional only in familiar environments. If a human is put in a world with irregular gravity he will have a hard time navigating the world. It is our claim that the kinds of worlds humans can function efficiently are not that many compared to the set of all possible variations of the world, from this claim follows that a successful Basic Intelligence System (BIS) can be built with a finite number of experiences. An optimum (non-optimum) experience is a pair of a problem and a successful (unsuccessful) action for it [6]. One more requirement is capability of generalizing or expanding an experience to similar situations. The resulting knowledge base is then capable of handling a subset of all possible worlds, where the subset is a union of blobs around the points representing optimum experiences minus the blobs representing non-optimum experiences [7, 8].

Thus, an analysis process of intuition experience with optimum and non-optimum is calling interactive sub-optimum. The concept of the intuition non-optimum is quite comprehensive. From the viewpoint of problems' entity, non-optimum means unfeasible and unreasonable; from the viewpoint of problems' behavior, it means non-ideal and non-good; from the viewpoint of problems' capacity, it means ineffective and abnormal; from the viewpoint of problems' change, it means obstacles, disturbance and influence. There exists a serious of non-optimum experience from the entity of the problem to the change of the problem, which causes non-optimum category. As to every kind of human intelligent analysis, there is the individual non-optimum category as well as the common non-optimum category. The so-called individual non-optimum category is decided by the characters of the problem, while the common non-optimum category is an objective entity. Figure 4 is a method of from non-optimum correction to optimum.

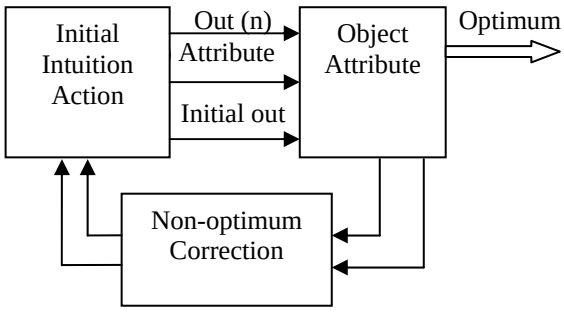

Figure 4. Learning pattern in non-optimum to optimum

There are three attributes of the recognition to the sub-optimum problem, experience, intuition and knowledge. The attribute of experience reflects the recognition to the characteristics of the object's behavior. Here the selection of the factors of the decision-making is discussed from the experience attribute's viewpoint. System experience provides sub-optimum for the problem. When the recognitions are different, the sub-optimum are different as well. The tracing to the system's conditions of the past can propose a sub-optimum.

To understand the entity and the accountability of the hypotheses is a tracing to non-optimum problems of the system, where experiences are most important. The experience system works with the experience environment, which is the base of the entity and development of the experience system, which in turn works on and influences the environment.

The tracing to the phenomena of the non-optimum system has its own nature and regulation, which has a close relationship with the nature and regulation of the system's experience. Experience is people's conclusion, improvement and accumulation through the recognition, enhancement and control of systems. Experiences develop with human being's entity and development, and the optimization of experience is one of the most important elements in the development of the society in the history. When experiences possess certain scientific value and form a certain system, they turn into knowledge. Thus, there is a process when experiences transform into knowledge.

From the viewpoint of the system's development, the experience of the recognition of non-optimum system is a changing process that develops and changes forever. Through endless feedbacks, the experiences take up changes of quantity, nature and degree, developing from simple to complicated, from material to abstract, from special to general and from undependable to generally dependable. "Failure is the cause of success". This proverb includes two contents for system analysis: non-optimum sets up the basis of the optimization of the system; non-optimum experience is the key concept of the system decision. Of course, the past, present and future of non-optimum is within a time framework, while the quantity and quality of the experience can reflect the contribution of the tracing to non-optimum system to re-recognize the system.

Experience is function of time, which are the primitive non-optimum experiences effecting on the source information of the non-optimum experience. It originates from direct recognition of sensibility. People's intellectual actions interact on each other, which brings about an experience series (to non-optimum problem) as time goes by and recognition goes more and more deeply. Thus the recognitions on non-optimum become general experiences, which in turn become common experiences and continually approach effective experiences. However, it will never reach the ideal experiences.

In the experience system, organizers and decision-makers ought to have a non-optimum information database, which can offer two things to the decision makers: non-optimum syndrome and a system of criteria. In the above analysis, non-optimum syndrome depends on experiences, which has a feasible area. The so-called feasible area of the experiences is an area composed of the maximum of the effective experience of every stage. (Sometimes the effective experience can be drawn from utilization rate of the experience.)

B. The Intuition Feature Index

Definition 1: Let A is a set of intuitive fuzzy and there is judgment-based experience level (Experience degree) $E_A(x)$, then $E_A(x) = E_A^o(x) + E_A^{no}(x)$, where $E_A^o(x)$ is an experience degree of optimum, $E_A^{no}(x)$ is an experience degree of non-optimum and $E_A(x) \to [0,1]$.

The definition with nature comes to following:

(1) If $E_A(x) = 1$, then with maximum experience degree for intuition judgment that is

$$E_A^o(x) = 1, E_A^{no}(x) = 0,.$$

Thus, the intuition judgment is optimization.

(2) If $E_A(x) \in (0,1)$, then experience degree (experience level) with interval in (0, 1), for $\forall \theta \in (0,1)$, IDM with the θ-level of experience judgment.

In IDM, there are no absolute optimums experiences or non-optimums experiences, and only under certain conditions of knowledge, is there differentiated relative optimum. Relative optimum can be seen as satisfactory result, because there are a great deal of uncertainty and non-linearity as explained by Simone: there are three defects in the traditional decision disciplines: to ignore the uncertainty of the economic life; to ignore the non-linear relationship of the real life; to ignore the subjective limitations of the decision maker. Simone held it that in the complicated real world; only a minority of problems can be solved through the calculus of the maximum and minimum value. Sometimes there are not the most optical solutions at all, and under most conditions people just try to find out a satisfactory approximate solution (relative optimum solution). The satisfactory criteria are composed of an upper limit and a lower limit. As long as the solution lies between the two limits, it is an acceptable one. Thereby the optimum interval takes the place of the optimum point. One aspect of the non-optimum analysis theory of systems is how to decide this optimum area. At the same time the goal and result out of the optimum area can be seen as non-optimum. Therefore, the criteria of non-optimum are a combined result of the system's factors falling in the optimum area [4].

In the non-optimum analysis, we introduced the concept of sub-optimum degree, through which we can describe any factor in the fuzzy system and tell whether it belongs to optimum experience, non-optimum experience or border zones. Meanwhile, the factors belonging to one

zone can be put into different layers according to the interval-optimum degree. According to quantitative expressions, we can give the following definition [7]:

Definition 2: Let $E=\{e_1,\cdots,e_n\}$ be a set of experience attribute of optimum in fuzzy system, optimum degree is $\mu(e)=\{\mu(e_1),\cdots,\mu(e_n)\}$, and there be a set $\overline{E}=\{\overline{e}_1,\cdots,\overline{e}_n\}$ of experience attribute of non-optimum, where non-optimum degree is $\mu(\overline{e})=\{\mu(\overline{e}_1),\cdots,\mu(\overline{e}_n)\}$ then must there be a set $I=\{I_1,I_2,\cdots,I_n\}$ and

$$I\subseteq E\times\overline{E}=\{(e,\overline{e})\,|\,e\in E\wedge\overline{e}\in\overline{E}\}.$$

Then I is called the intuition feature set.

Definition 3: Let I be a set of intuition feature, There be a $I=\{I(r)\,|\,r\in R(e,\overline{e})\}$, where $R(e,\overline{e})$ be a relationship of optimum and non-optimum, $I(r)$ be a intuition feature index (IFI), and $I(r)\to[0,1]$, without loss of generality, we have

$$I(r)=\begin{cases}1 & \mu(\overline{e})=0,\mu(e)\neq 0\\ \frac{1}{2}[1+(\mu(e)-\mu(\overline{e}))] & 0<\mu(e)\neq\mu(\overline{e})<1\\ 0.5 & \mu(e)=\mu(\overline{e})\end{cases}$$

$$(\mu(e)+\mu(\overline{e})=1)$$

Thus, Figure 1 shows geometrical of IFI.

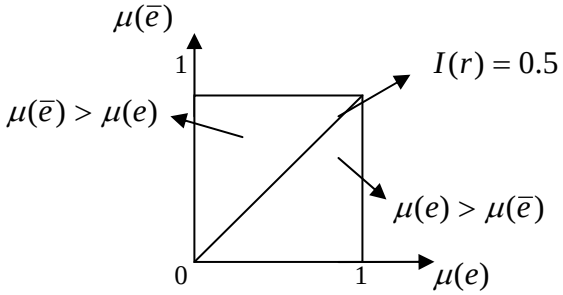

Figure 5. The Intuition Feature Index

The definition with nature comes to following:

(1) If $I(r)=1$, then with maximum certain degree for intuition judgment, that is with maximum membership degree for fuzzy sets.

(2) If $0<I(r)<1$, then a degree of intuition judgment with θ-level, where $\theta\in(0,1)$, and there be a fuzzy set

$$A=\{\mu_A(x_1),\mu_A(x_2),\cdots,\mu_A(x_n)\}=\{\theta_1,\theta_2,\cdots,\theta_n\}$$

based on IFI, thus, the IDM is interval-optimum with intuition certain degree $I(r)\in(0,1)$.

Ⅳ. THE IMIPI AND LEARNING SYSTEM

A. The Definition of IMIPI

Intuition Relationship Mapping Pattern Inversion (IRMPI) refers to a general method or criterion in problem solving. It belongs to a working principle of general methodologies .

In founding the intuition learn system (ILS) IDM, the focus is finding the proper methodology in realizing the learn aims. Then it may embody the intellectual aspect in the learning system. By analysis, we find that Interactive Mapping Intuition Pattern inversion (IMIPI) is a useful tool in constructing this brain sense. Here firstly we give a supposition. In brain thought practice, by analyzing the attribute of the brain thought, and can construct a sensation model. Thus, we may found a similar image model of the initial sensation. Normally, the detector could not see the crime procedure on spot. After crime happened, people will never experience the scene again. Consequently, only by mocking and recognizing could people realize and grasp its changing regular patterns. The happening of a case composes a specific commitment shaping in a certain space. It is determined by the initial crime construction. Here, we call the suspect fuzzy relationship former image, the case shaping from the spot reflecting fuzzy relationship. Supposedly, by this kind of interaction relationship, we can confirm the specific shaping. So we get the specific initial image. Encouragingly, this initial image is to be the suspect. This running principle is being called Intuition Fuzzy Mapping pattern Inversion (IMIPI) principle.

However, in reality, there is Interactive Mapping Relationship (IMR). Thereafter, to found the Intuition Pattern Inversion (IPI) $I(r)$ has practical significance. Simply to say, we shorten this into IMIPI. Firstly, here's the description of this principle:

Let R represents the relationship construction of the interactive of real pattern (with non-optimum and optimum), which include certain pattern P , let $f:R\to IR$ represents a kind of mapping. By this function suppose the relationship of the initial image R be inversed into the interactive relationship of intuition IIR . In the latter relationship there is unknown problem (the real pattern) P which lead to intuition pattern IP . We firstly find IP , then with the inversion i.e. function we find real pattern P . This is called IMIPI principle.

In study practice, general meaning may be vested to mapping and inversion. For instance, the brain forms intuition judge as one in face of the things. It is the representation of intuition feature or intuition relationship. Just take the process of intuition judgment forming as the mapping of the brain's action. So, the intuition relationship is the intuition judge's shaping of its real pattern. Using thinking of intuition relationship helps to conclude and to resolve problems on the basis of the former models. This procedure could be called intuition mapping pattern inversing process.

The main objective of these processes is to retain the interactive optimum salient characteristics necessary for the recognition process, and to reduce the dimensionality of the knowledge measurement space so that effective and easily computable algorithms can be devised for efficient categorization.

B. The Interactive Intuition Learning System

At the beginning, we talk about the realistic brain thought pattern reflect by concept space CS of real pattern space PS and intuition pattern space IPC. Suppose in a certain crime pattern CP there is the fuzzy relationship R which could be got. But, we can hardly find CP with R. On the other hand, if IC and IR are known to us, or we can find IC and IR with C, then we can solve the problems of pattern with the help of IFMPI principle. See figure 6

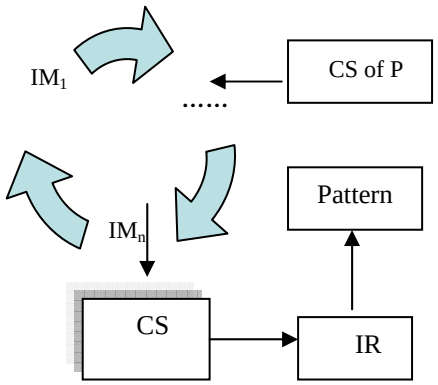

Figure 6. Learning System Based on Concept Space

Suppose CS the brain concept space, between this, there are all kinds of pattern relationships, these relationships are posed by varies commitments. That is to say, different people commit on different scales. It could be gained by the analysis of probability. The sorting of the former statistics of the sense model space, which may be input the computer as the real sense pattern system for recognizing suspects.

We all know, each sense is unrepeatable, they are not mutual constructive but mutual stated. Consequently, through the sense model space of the real pattern system we can forward all kinds of intuition models $IM_i(i=1,\cdots n)$ these intuition models were gained by pattern relationship analysis so inevitably subjective. In addition, when a specific problem occurs, it shows a IR in the intuition concept space, we can confirm the intuition pattern of this problem.

Ⅴ. THE APPLICATION IN CRIME KNOWLEDGE MANAGEMENT

A. Crime Knowledge Management

Database technology plays an important role in the management of information for a police department. Solving problems by analyzing and generalizing current criminal records is a function of the daily routine of many crime analysis and detectives. The amount of information that these investigation must analyze is often overwhelming, a phenomenon often referred to as "information overload". Potent intelligence tools can be useful in the analysis of available criminal analysis' information overload and reducing information search time [9]. There are currently a number of systems that serve as intelligence analysis tools for law enforcement. Many technologies use neural networks to solve problems by developing association between information object and being trained to solve problem by comparing know object with unknown object. Some application utilizes visualization and time analysis to examine information.

For example, the Timeline Analysis System (TAS) can help analysis visually examine large amounts of information by illustrating cause-and-effect relationship. This system graphically depicts relationship found in the data, resulting in trends or patterns. Expert systems that employ rule-based information have also been developed to assist in knowledge-intensive activities. These systems attempt to aid in information retrieval by drawing upon human heuristics or rules and procedures to investigate tasks [9, 10].

If we try to apply information theory to the criminal behavior of human, then we have to integrate activity, perception, and learning. In this paper we are looking for an interpretation of 'knowledge', which is compatible with concepts of intuition activity and learning. Going this way, we hope to avoid the paradox of 'new' knowledge. Knowledge before and after the reception of a message is not the same! Different concepts are introduced in the literature to 'solve' this paradox.

We found that intuition concept space (ICS) of knowledge discovery is effective tools that they build intelligence activities. In practice, detectives basing on properties resolution of the given case dream up mimetically, and then forming approximate mode image with primary case. Generally case, detective can't see the procedure of the case.

Happened, persons can't see that prisoner do all the things on location. Only through mimetic reproduction, we can recognize and master its law of development and changing. So, that it accord with crime character and basic law is rush.

First, the general area of knowledge management (KM) has attracted an enormous amount of attention in recent years. Although it has been variously defined, it is evident that knowledge management exists at the enterprise level and is quite distinct from mere information. Also apparent in this area are the challenges that knowledge management poses to an organization. In

addition to being difficult to manage, knowledge traditionally has been stored on paper or in the minds of people. The KM problems facing many firms stem from barriers to access and utilization resulting from the content and format of information. These problems make knowledge management acquisition and interpretation a complex and daunting process. Nevertheless, knowledge management information technologies have been developed for a number of different applications, such as virtual enterprising, joint ventures, and aerospace engineering. The same problems of knowledge management exist at the specialized organizations of police department.

A basic task for detectives and crime analysts at Dalian Police Department (DPD) is to create knowledge from information. In this case, information is made up of approximately 1.5 million criminal case reports, containing details from criminal events dating back to 2003. Tacit knowledge has also been described as the means through which new knowledge is generated as well as the practical knowledge used to perform a task. It is tacit knowledge that is used as investigators try to tie together information to solve cases and crimes. This ability to combine information to create knowledge is often hampered by the amount of information that exists. See figure 7.

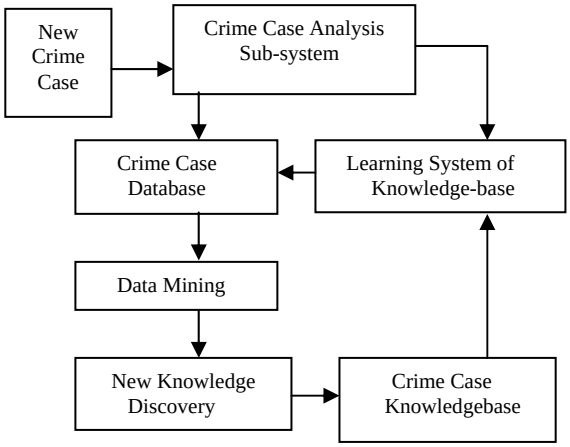

Figure 7. Crime Knowledge management System

B. Crime Knowledge mapping and Intuition Inversion

In the application of concept space to the collection of DPD case records, a number of modifications were employed. Provides more detail on the interactive learning of the intuition concept space. IMIPI refers to a general method or criterion in knowledge discovery. It belongs to a learning principle of methodologies of knowledge system. In founding the professional detective system, the focus is finding the proper methodology in realizing the detective aims. Then it may embody the intellectual aspect in the professional detective system. By analysis, we find that IMIPI is a useful tool in constructing this intellectual behavior. Here firstly we give a supposition. In detective practice, by analyzing the attribute of the case, the detector can construct a crime model. Thus, we may found a similar image model of the initial case. Normally, the detector could not see the crime procedure on spot. After crime happened, people will never experience the scene again. Consequently, only by mocking and recognizing could people realize and grasp its changing regular relationships. The happening of a case composes a specific commitment shaping in a certain space. It is determined by the initial crime construction. Here, we call the suspect relationship former image, the case shaping from the spot reflecting relationship. Supposedly, by this kind of relationship, we can confirm the specific shaping. So we get the specific initial image. Encouragingly, this initial image is to be the suspect. This running principle is being called detective Interactive Intuition Inversion Principle (IIIP). However, in reality, there are Interactive intuition relations. Thereafter, to found the intuition relationship inversion has practical significance. Simply to say, we shorten this into IIP. Firstly, here's the description of this principle: Represents a kind of mapping. By this function suppose the intuition relationship of the initial knowledge of crime K_C be inversed into the concept space of crime knowledge shaping CS_C. In the latter relationship there is unknown crime behavior H_C which lead to shaping IC. We firstly find intuition concept of crime behavior IC, then with the Intuition inversion i.e. function we find H_C. This is called Knowledge Mapping Intuition Inversion (KMII). See Figure 8.

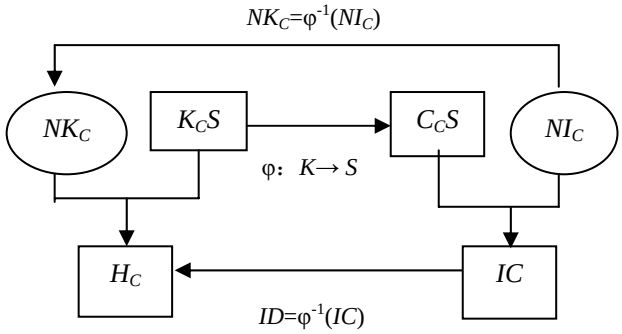

Figure 8. The inversion construction of mapping

In study practice, general meaning may be vested to mapping inversion. For instance, the brain forms intuition concepts as one in face of the knowledge of the crime behavior. It is the representation of intuition feature or relationship. Just take the process of intuition concept forming as the mapping of the brain's action. So, the intuition concept is the crime behavior's shaping of its initial image. Using thinking of intuition concept helps to conclude and to resolve problems on the basis of the former models. This procedure could be called inversing process. At the beginning, we talk about the realistic problem reflect by initial knowledge system K_CS and the concept construction of crime C_CS on knowledge shaping system. Suppose in a certain crime behavior H_C there is K_CS which could be got. But, we can hardly find H_C with K_CS. On the other hand, if C_CS

are known to us, or we can find $C_C S$ with $K_C S$, then we can solve crime problems with the help of WMII.

We all know, each crime case is mutation-characterized, and unrepeatable, they are not mutual constructive but mutual stated. Consequently, through the crime model space of the initial knowledge system we can forward all kinds of crime pattern. These patterns were gained by intuition concept space (ICP) analysis so inevitably subjective. In addition, when a specific case occurs, it shows a concept construction $C_C S$ in the social crime system. By the information of the spot and other surroundings, we can confirm the shaping of this crime case. Further, as the relative information is extension, $C_C S$ is too. In fact, $K_C S$ which determines the Intuition Concept Construction (ICC) of crime pattern, is not a static intuition relationship construction, but a never-ending changeable and new-sense creative extension one. Moreover, only if the specific information is input to the initial image can the suspect be made sure. Thereafter, $K_C S$ may be thought as the primary-state ICC, $C_C S$, the shaping of this construction. Notwithstanding, for the uncertainty of the crime actions, the mapping provided by the initial knowledge system i.e. crime pattern could no longer reflect the attribute of each case. That's to say, $C_C S$ is insufficient to confirm the shaping of the suspects. Only by adding the specific new information NI_C to the certain cases based on $C_C S$ this information should be input the initial knowledge system $K_C S$ thus is learned, we gain new shaping knowledge. By this means, we can confirm the shaping of the suspect and the suspect respectively.

Here we depict KMII mathematically: suppose φ is a mapping, it maps the element from the knowledge collect $C_C = (k)$ into another one $C_C = (k)$. In this, C_C represents the shaping of k , k is called the initial knowledge. Thus,

$$\varphi : W \to C, \varphi(k) = C$$

In criminal investigations, an officer can acquire information leads that fall into a number of different categories and work together to create the 'story' that describes the crime. The crime type identifies the type of crime committed in accordance to the standard crime case classification system that is used in the China. Vehicle information contains a number of possible fields, including the make, model, type, year, color, and license plate number. Users are able to search on any combination of these elements and across different fields. By employing different search objects, officers are able to easily search by the specific type of information that he/she has available.

Ⅵ. CONCLUSION

From this pilot study, we conclude that the use of IMIPI as a knowledge management and intelligence analysis tool in a law enforcement environment is quite promising. An important aspect of the study is that it dealt with real criminal information, real cases and search tasks and real crime analysts. We use human being physiological immanent thinking to observe. Find that a lot of actions all put up no logic. Some person considered that solving the question like this certainly. When asked him why, he couldn't say what mechanism it is clearly. In fact, researching some feeling inference's operation mechanism isn't significant largely. The important thing is whether having a inference system that is fix on brain thinking properties. The system's guiding can advance thinking, decision and cooperation inference. As a matter of fact, the key of founding the system of extension automatic crime detects reasoning is to make good use of the ICS. However, it requires good man-computer functions. Meanwhile, the statistical information function is also needed. The studies and practices show that, the using of IMIPI principle combining intuition automatic reasoning surely has a promising future.

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