The Tessi Clergy Algorithm Inspired by Potential Gaming Behavior in the Hunt for Geo-data

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***Abstract*—The paper constructs a geo-knowledge/genetic algorithm model based on mathematical methods, which always links the behavior time, behavior distance, and geo-data acquisition quality of all mobile patterns with the overall geo-knowledge evolution process. For the demand of the Tessi missionary groups (geo-data carriers) to acquire geo-data and the response of the local decision-making group, we combine the quality evaluation of the map artifacts after data alignment, realize the discrimination of the dominant strategy, partial game, complete conflict game and natural game in their data game process, deduce the game strategies in the knowledge evolution process of data acquisition, data processing, data management, data protection and data competition. The model is used to describe the above behaviors algorithmically and to explain the extent of knowledge evolution behaviors at the macro level, as well as to provide a new reference solution for computational modeling of games in complex social computing using coupled object-event-process data.**

Keywords- the Tessi Clergy Algorithm; knowledge services; knowledge iteration; game theory; geosciences

I. Introduction

The Tessi Clergy Algorithm (TCA) is a new swarm intelligence optimization algorithm that simulates the social behaviors of a group of Tessi missionaries and typical individuals in the 15th-16th centuries. The study takes Matteo Ricci (the Tessi missionary) as an example, and focuses on Ricci's behavior tracks of carrying early global geo-data, playing data games with the Chinese Ming and Qing dynasties to achieve data evolution, as well as the results of knowledge games such as the data products produced by his group and kept in East Asia at a later stage, such as the *Kunyu Wanguo Map*, *the Kunyu Quantu* and the global maps published in the West at the same time. The paper explores the behavioral process of the Tessi missionary groups in acquiring, enhancing, absorbing, and optimizing oriental geographic data in the iterative process of global geographic knowledge, and algorithmically describes the optimization ideas and game strategies embodied by its group intelligence in the competitive process of geographic exploration and knowledge protection.

The second part of the article introduces the historical background of the cultural exchange between the Tessi missionaries and China; the third part focuses on the geo-data, the core element of model construction, and introduces the natural and special properties of geo-data different from other material exchanges; the fourth part gives an abstract overview of the behavior of the Tessi missionaries; the fifth part introduces the principle, calculation method and process of TCA; the sixth part presents a case study of geo-data in 15th-16th century maps based on the deep learning approach; the last part concludes and outlooks this study.

II. Background

During the Tang Dynasty, the Nestorian Christians of the Eastern Roman Empire entered China along the Silk Road. During the Yuan Dynasty, both Nestorians and Roman Catholics sent missionaries to China, such as Johnof Marignolli and Mangovino; however, with the fall of the Yuan Dynasty, the western missionaries became extinct in China. In Ming Dynasty, western missionaries broke through the confinement and gradually completed the acquisition of Chinese geo-data and realized the iteration of global geographical knowledge. The Qing Dynasty was the key time when western missionaries were deeply involved in the acquisition of geographic data in China: between 1552 and 1800, there were 920 documented Jesuits coming to China, and the surge in numbers was directly due to the opening of new routes in Europe. During this period, the first Portuguese Jesuit missionary to China, Father Francis Xavier, arrived in Guangdong in 1552, but died of illness on Shangchuan Island. A total of 32 Jesuits, 24 Franciscans, 2 Augustinians and others then tried to settle in China, but were unsuccessful. In 1580, Jesuit Italian missionary Luo Mingjian arrived in Guangzhou, and then preached in Zhaoqing, Guangdong, and Shaoxing, Zhejiang. In 1578, Italian missionary Matteo Ricci sailed from Lisbon, Portugal, across the Atlantic and Indian Ocean to India, and from India he crossed the Strait of Malacca into the Pacific Ocean, arriving in Macau in 1582. In 1594, he entered Shaozhou and carried out missionary activities in the name of spreading "Western learning", arriving at Nanchang in 1595 and Beijing in early 1601. After Matteo Ricci, missionaries such as Tang Ruowang, Bi Fangji and Nan Huairen came to China one after another and gained the trust of the rulers in the Ming and early Qing dynasties. According to statistics, during the Kangxi period of the Qing Dynasty, there were churches in 28 cities across the country, with about 150,000 members. In the global maps published by Western countries in the same period, it can be found that the geographical data of China had been largely accurate and detailed, and the data on administrative divisions, city distribution, road networks, hydrology and species

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information had evolved, which greatly served the establishment of global geographical science.

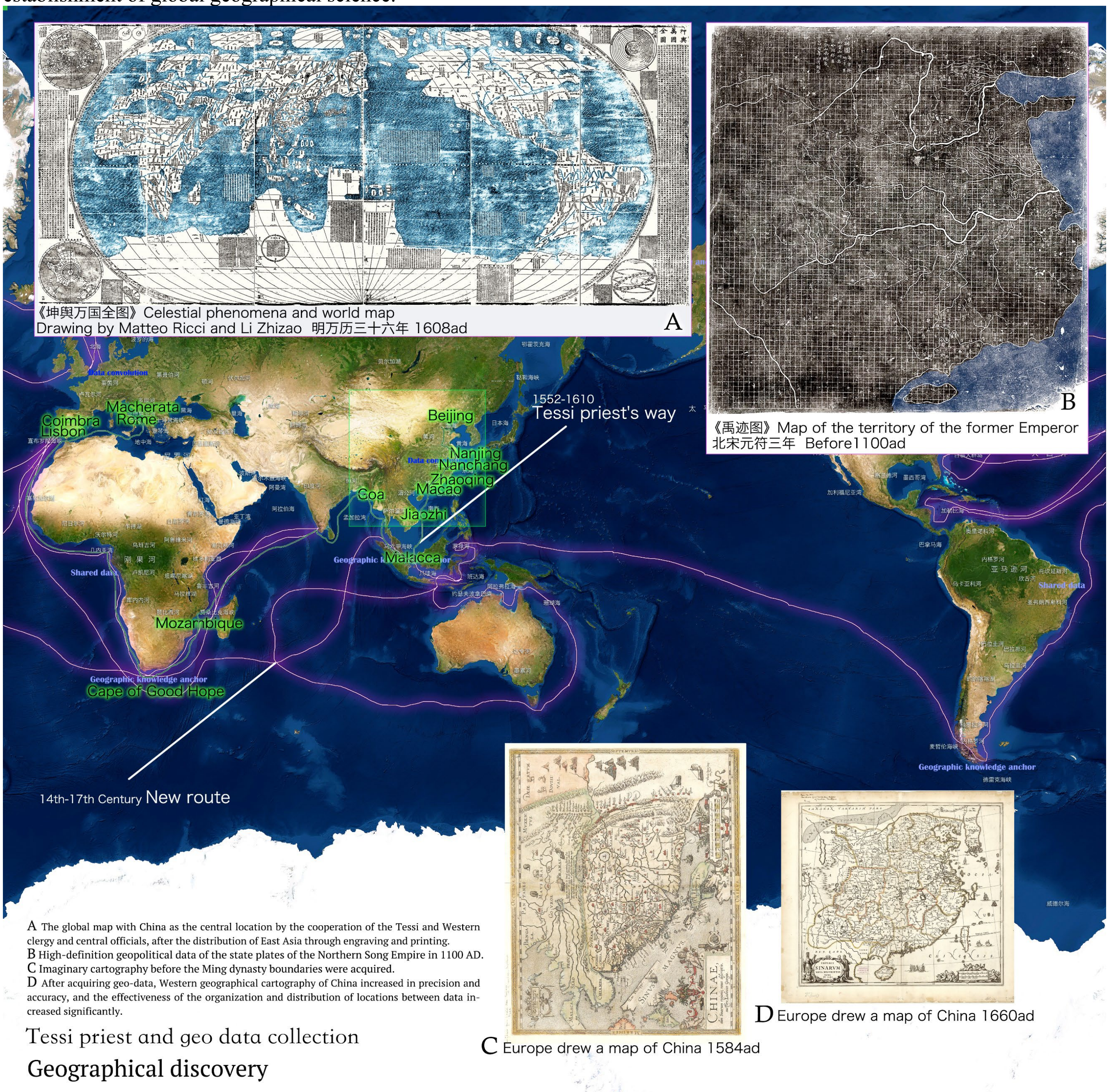

Fig. 1. Geo data collection of Tessi priest in geographical discoversy.

III. Focus: Geographic Data

A. *Access to geo-data*

The initial population in the Tessi Clergy Algorithm is made up of a randomly generated set of seminarians, with each missionary considered as a feasible solution to the optimization problem. A certain percentage of the clerical membership are the exploratory missionaries, and the rest are the resident missionaries [1]. Within each religious order, some resident missionaries have specific knowledge exchange and knowledge service privileges when acquiring geo-knowledge, and implement behavioral strategies guided by gaming strategies. Some resident missionaries in each Order are responsible for refining data processing, including validation, cleansing and organization; the remaining resident missionaries consolidate data protection and data transfer by serving and distributing knowledge, penetrating new areas that have been opened up. With exploratory missionaries gaining enhanced access as they pass through areas that are progressively expanded, increasing higher levels of data exchange and sharing services in order to move to wider areas for global exploration. Ultimately, the roaming will enable the synchronization and continuous access to geo-data in the 'foggy' regions represented by the Tessi missionaries, improving the energy efficiency of local exploration and serving the goal of global geo-knowledge iteration.

An important indicator for evaluating effectiveness of data acquiring is the quantity and quality of data. The foundation of modern western science is also based on geographic data, which is immaterial, transitive, diffusive and reproducible [2]. The occurrence of iteration must also depend on the comprehensive completion of global exploration. With the completion of basic geographic data collection around the world, geographic data in East Asia, centered around China, is not directly accessible through Western cartographic practices due to the independence and closed nature of the Chinese feudal dynasty. Access to geo-data on China has become an important goal for missionaries in addition to preaching, as well as an urgent need to co-construct geo-data standards for East Asia and to iterate on global geo-knowledge.

B. *Natural properties of geo-data*

The definition of the properties of geographic data is determined by its natural properties. Once the geographic data has been produced and published, the act of co-appropriation and sharing makes data infinitely reproducible or reproducible in space. When others access or use it, however, this does not mean that the producer of the knowledge loses ownership of it, but rather its possession and use in the same way as the many consumers, without quantitative restrictions or interventions.

Since nature has given it such properties, it cannot be controlled by the producers in the same way as things that are possessed and used through the physical act of holding onto them and through agreements with others, a system of control is established in which all members of society within a certain geographic area agree to abide by certain rules and laws concerning the possession and use of knowledge.

C. *Special properties of early geo-knowledge*

1) People who produce geographic data through the act of mapping have initial exclusivity and absolute rights over the geographic data they produce. This power is similar to ownership in property in some aspects, such as the right holder has direct dominion over the object and can use, benefit, dispose of, and make other kinds of dominion (but not a matter of possession); it is also transferable (including inheritance), etc. No one other than the right holder may enjoy or use the right except with the right holder's consent or as provided by law. The exclusive right that indicates the exclusive possession or monopoly of the right holder is strictly protected from infringement by others. The object of production of geological knowledge is the result of data calculations of human exploration, and the exclusive right of the right holder can be changed only through the procedures of "compulsory license" and "expropriation.
2) The content of property rights of geo-knowledge is complex (multiple rights) and has genetic diversity of data. Therefore, although its generation is based on the premise environment of data base, collection standard, measurement standard and technical diversity, the property right and the producer's (entrusted party's) personality right and property right stand side by side and form a category of their own, with economic and non-economic nature of the right.
3) Geo-knowledge is bound by territoriality, i.e. it is only valid in the territory in which it is recognized and protected; i.e. a right protected by the law of a country only has legal effect within that country, except in the case of a convention or bilateral agreement.
4) The monopoly of early geo-data has a statute of limitations and is protected for a period of time before the emergence of new discoveries. With subsequent, effective iterations of data production, the duration of protection is shortened.
5) Although copyright in geo-data products is a private right, and although the law also recognises its exclusivity, it cannot be exclusively owned by anyone for a long period of time because of the highly public nature of human intellectual output, which is closely related to the development of society, culture and industry, so subsequent laws have established restrictions on it:
   a) In terms of the occurrence of rights, the law provides for various positive and negative conditions and methods of publicity. For example, the occurrence of exclusive rights in logbooks is subject to application, examination and approval and filing with the regulator, and the right of attribution for certain matters, such as the exploration of unknown territories, and does not grant patents.
   b) In terms of the duration of the rights, the law has special provisions, which are not repeated in this article.
   c) The right holder is under certain obligations to use or enforce them. The law provides for a compulsory license or compulsory enforcement license system. For copyright in geo-data resources, the law also provides for a fair use regime

IV. The Behaviors of the Tessi

Along with the great expansion of European colonialism abroad after the geographic discovery, China was one of the key areas of overseas missions of the Jesuit priests in order to fulfill Loyola's vow of "conquering the world for Christ". The

Tessi missionaries constitute a group of actors with a common goal of global optimality, and they exist in the form of a social organization of religious orders, of which there are two types, the resident missionaries and the exploring missionaries. The resident missionaries are those who are resident in the diocese, while the exploring missionaries are those who are out of residence and actively responsible for exploration. However, a exploring missionary may change his behavior and become a resident missionary when he opens a new parish or integrates into a new area, or vice versa.

The Tessi missionaries in the Order are essentially stable, bound by oceanic routes and communities, and will generally adhere to a single organization that is the core of the Order, with most remaining in their original Order after they become members, and a very few individuals leaving or betraying to join another Order. The Tessi missionaries are responsible for the training and education of knowledge, ensuring the sharing of knowledge and the synchronization of cognitive strategies with the community. The religious order also admits newcomers, expanding the effectiveness of knowledge dissemination and data acquisition. Each diocesan area is quite well defined, and the core missionaries, tasked with exploration, often do not always stay in the diocese, but must travel around the diocese year-round to consolidate the entire territory through the dissemination of sermons and knowledge sharing and data exchange, where knowledge sharing includes technology, language, literature, art, etc., and data exchange includes geo-information, administrative data, hydrological data, trade information, social class information, etc. Whether the archdeacon can consolidate and develop the diocese depends on evaluating whether it has enough knowledge to serve to develop the demand side of the local government, institutions, society, and communities.

Within the missionary community, the exploratory missionaries are the primary data acquirers and the resident missionaries are the primary data processors and deliverers. Collective coordination of missionaries can increase the probability of success of knowledge iterations, so often several or groups of Tessi missionaries accumulate and pioneer for years or decades, together improving the environment for data acquisition from different knowledge service processes, enabling data exchange with local area jurisdictions or geo-data owners, and through data synergy and location, enabling geo-data iterative products - maps - and based on this, continuously increasing the volume and granularity of data [3]. The total amount and granularity of data will be continuously increased based on this. In terms of geo-data publishing rights, the exploring missionary has undisputed priority and receives direct attribution, with the auxiliary missionary and diocese second, while the wider base of data collection and data providers generally do not have associated knowledge rights.

There was also a complex relationship of rivalry and competition between the religious orders. For example, the Jesuits, who had formed a community of interest with Portugal, sought exclusive missionary privileges in Japan and China, while the Franciscans, Dominicans and Augustinians, who were under the control of Spain, tried to infiltrate and squeeze out the traditional territories of the former. When Portugal and Spain merged in 1580, the conflict between the two sides, instead of being eliminated, intensified and eventually led the Japanese Shogunate to take the extreme measures of prohibition and seclusion. The relationship between such characteristic attributes and geopolitical data collection in this study remains in line with the concept of extrapolation of the Tessi algorithm, discussed in other articles.

It is clear from the above that the Tessi missionaries, through coordination and division of labor, have accomplished something that no individual missionary could accomplish, namely, the collection of global geo-data. The behavior of the Tessi missionaries is typical of group intelligence, and the overall level of intelligence emerging from the group has far exceeded the intelligence of its constituent individuals [4]. Therefore, the following mathematical description of missionary behavior patterns is based on a group intelligence algorithm.

V. The Tessi Clergy Algorithm

The initial population of TCA is composed of a set of randomly generated missionaries, treating each missionary's behavior as a feasible solution to the optimization problem [5]. The initial population is chosen with a certain probability to assign some of the missionaries as exploratory and the rest as resident missionaries. The territory of a diocese consists of the area of each member's best visited location. In each act of exploring geo-data, some of the missionaries are randomly selected to socialize: first approaching towards a target (a data owner in a neighboring area or a population that might implement data collection); then acquiring data resources through the organization of the act (landing of knowledge services, exchange, sharing, gifting, etc.). The rest of the missionary, under their own skills and work distribution, complete the process of deepening the exchange of protected data and the processing, handling and transmission of the data, respectively. The archdeacon in the diocese, roaming within his diocese, anticipates how to implement the strategy. In addition, the exploring missionary does not move randomly in the area he explores, but can only gain permission to move to new places by relying on the completion rate and quality of the previous actions, bounded by spatial autocorrelation [6][7].

A. *Principles of the algorithm*

The geo-data hunt undertaken by the missionaries consists of direct access (survey records), shared exchange (translation from the same language) and access gaming (data exchange). In the process of implementing the data-hunting objectives of the religious order, the order first sends exploring missionaries to the known range of data-possessing places or areas that may have data, approaches them, obtains information about the target place and reports to the dean of the order; the dean selects the missionary target area based on the information, then sends exploring missionaries to explore or resident missionaries to missionary destinations; the resident clergy acquire data resources through behavioral organization (knowledge sharing, data exchange, value giving), carry out implicit data collection activities in the form of explicit knowledge services, and pass the acquired data back to the archdeacon and eventually export it back to the patriarch, realizing the replenishment of global geo-data and supporting the production of global maps.

The missionary travels to a non-diocese for missionary activity based on the assignment of the target of the data collection. The resident missionary arrives at the destination with the Order's precognitive data about the local area and chooses to engage in a data exchange activity with the local data holder. In this type of activity, the local data holder has already lost some of the data as the missionary already has some of the local data. In this case, the amount of data available to the local data holder is b. The local data already acquired by the missionary is called b'. The missionary claims that he already has a volume of data from other areas as a (the volume of data is far greater than one could imagine at the time) and offers to share it with the local data holder (in the form of identification with 'Confucian' beliefs, through interaction with intellectuals and access to local officials) and proposes a translation into the same language, with the data consolidated for a joint publication. The commitment is that the final joint publication (public opinion map) will have a geo-knowledge data volume of (*a*+*b*). Local officials, in choosing whether to share or not, are highly vulnerable to the judgement of choosing to share due to the prior advantage of the missionaries [8].

Table 1. The Game of Missionaries and Officials

Preacher\Official	Agree	Refuse
Agree	*b-a*, *a-b*	*-a*, *-b'*
Refuse	*b*, *-b*	0, *-b'*

a. Nash equilibrium in the game of missionaries and officials

Extrapolating the game theory perspective, if the missionaries refuse to share, then the local officials should also choose to refuse to share so as to minimize the amount of damage. In effect, because the missionaries have already chosen to share and have access to some of the local data, the only option for local officials who want to gain access to unknown knowledge is to cooperate with the missionaries. In order to achieve sustained advantage in the game, the missionaries must always be on the dominant side of the knowledge data sharing act to ensure that the missionary act is carried out and not fall into the trap of 'being preached'. If both parties choose to share, it seems that the missionary has more to lose by exporting knowledge than to gain data; but in reality, gaining b data brings much more value to the missionary. We cannot discuss this in terms of data volume alone, but should be equally concerned with geographic knowledge data accuracy and availability. From a global perspective, the data acquired by missionaries are scarce data serving global geographic awareness, commercial trade, route traffic, etc., and are more highly valued in terms of timeliness; whereas the data shared by missionaries are stale, invalid, and low accuracy data. By the time the newly hunted data is incorporated into the computation, the old data itself is already in the realm of being cleaned and iterated.

In the process of geo-data exchange, data quality is closely related to the outcome of the gaming behavior. Through the comparative test in the case of the *Kunyu Wanguo Map*, the feedback characteristics on the contextual scenario, and the quality of the pre- and post-act East-West global map formation during the occurrence of this behavior are calculated. It can be found that in the knowledge exchange process, the geo-data provided to the Chinese by Matteo Ricci, although wide in scope, involved very few data points per unit area in the key ecclesiastical power area, very low shoreline accuracy, poor data quality, and low accuracy of extended information, which was assessed from the perspective of the imperial powers-that-be and was classified as unusable information; whereas the Chinese shared a relatively narrow area with extremely high accuracy of data points per unit area. The quality of the information is high and it is highly valuable and usable information for the missionary objectives of the Holy See and the development of West-East trade. Therefore, it can be judged that the tactical behavior of the Tessi won out in the process of potential gaming.

B. Target selection for the Archdeacon

The Archdeacon's choice of destination is a global choice. The archdeacon receives data from other religious of the Order about each location and selects the next missionary destination based on this information. The choice is influenced by three aspects: first, the value judgment of the candidate site; the higher the rank of the city, the larger the data holdings, and the larger the influence range, the stronger its value; second, the degree of inspiration in the path trajectory [9], which is inversely proportional to the distance between the current location and the candidate site; third, the amount of known data about the city; the larger the amount of known data, the more favorable it is in the subsequent data gaming behavior, and the more likely the city will be selected [10]. The probability of the total deacon choosing the target location can be expressed as

$$P_j(t) = \begin{cases} \dfrac{\tau_j^{\alpha}(t)\eta_{ij}^{\beta}(t)\gamma_j^{\theta}(t)}{\sum_{s\in allowed}\tau_s^{\alpha}(t)\eta_{is}^{\beta}(t)\gamma_s^{\theta}(t)}, & s \in allowed \\ 0, & else \end{cases} \tag{1}$$

$$\eta_{ij}^{\beta}(t) = \frac{1}{d_{ij}} \tag{2}$$

where $P_j(t)$ denotes the probability that the chief deacon selects candidate point j; α is the relative importance of value attractiveness, τ_j denotes the value attractiveness of target j, the higher the city rank of the target the greater the value attractiveness; β is the relative importance of distance element, η_{ij} denotes the accessibility between city i and j, d_{ij} denotes the distance between two cities; θ denotes the relative importance of the amount of predicted data, γ_j denotes the data about city j already available to the chief deacon.

C. Exploratory behavior

Exploration missionaries' exploration behavior is localized exploration. Exploratory missionaries perform data collection activities for carpet exploration of neighboring areas, and they report the collected data to the chief deacon, who makes decisions based on the collected data and distributes the data of a certain area to the resident missionary, which becomes the predictive data of the resident missionary for that area in order to start data gaming.

When the exploring missionary explores, assume that the current position of the i th exploring missionary is X_i^c, calculate the fitness value Y_i^c of that position according to the fitness function , select a random position X_k^c within the feasible range R^c of the exploring missionary , calculate the corresponding fitness Y_k^c.

$$X_k^c = X_i^c + R^c \times rand \tag{3}$$

where R^c is the feasible range for exploring of the missionary; $rand$ is a random number between 0 and 1. If $Y_i^c < Y_k^c$, then the position of the missionary further ahead in the direction of Y_i^c as

$$X_{next}^c = X_i^c + \frac{X_k^c - X_i^c}{\left\| X_k^c - X_i^c \right\|} \times step^c \times rand \tag{4}$$

$step^c$ is the transferring step length of the exploratory clergy.

If $Y_i^c \geq Y_k^c$, do not move forward, select a random position within the feasible range R^c of position X_i^c to calculate the fitness and compare. Perform *trynum* times to choose still not move or move the number of times to reach *movenum*, the exploratory missionary selects a random point in the range R^c to collect data according to (4), returns to the seminary, reports the location and data for that point, and waits for the next assignment [11][12].

The fitness function for a position can be expressed as

$$F(X_k^c) = \tau_k^\alpha(t)\eta_{ik}^\beta(t)\gamma_k^\theta(t) \tag{5}$$

where α is the relative importance of value attractiveness, τ_j denotes the value attractiveness of target j, and the higher the city rank of the target the greater the value attractiveness; β is the relative importance of distance element, η_{ij} denotes the accessibility between city i and j, d_{ij} denotes the distance between the two cities; θ denotes the relative importance of the amount of predicted data, γ_j denotes the data about city j already available to the chief deacon.

Exploratory missionaries perform data collection for selected locations within the field of view. In the act of data collection, missionaries only collect data and do not share data; the amount of local data neither increases nor decreases [13].

$$D_{mnew}^j = D_m^j + rand[0,1] \cdot (D_l^j - D_m^j) \tag{6}$$

where D_m^j is the current data holding performance of the missionary, D_l^j is the local data holding performance at position j, and $rand[0,1]$ is a random number between $[0,1]$; $(D_l^j - D_m^j)$ reflects the local data D_l^j to the data D_m^j known to the missionary about the local augmentation. If the adaptation of D_{mnew}^j is better than the original adaptation, the amount of known data at that location is updated, $\gamma_j = D_{mnew}^j$.

D. Missionnary behavior of resident clergy

The resident missionary arrives at a location and presents a data exchange plan to the local officials to perform an act of mutual benefit [13]. Although it is called an act of mutual benefit, in essence the local officials share usable information to the missionaries, but the missionaries may or may not share usable information to the locals. As a matter of principle, usable information will enhance data holding performance, and unavailable information will not diminish data holding performance.

$$D_{mnew}^j = D_m^j + rand[0,1] \cdot (D_{best} - M_v \cdot B_1) \tag{7}$$

$$D_{lnew}^j = D_l^j + rand[0,1] \cdot (D_{best} - M_v \cdot B_2) \tag{8}$$

$$M_v = \frac{D_m^j + D_l^j}{2} \tag{9}$$

where B_1 and B_2 are random numbers in $\{1,2\}$, respectively, denoting the benefit factors in the mutual benefit relationship. M_v is the mutual benefit vector of the relationship [14]. If the adaptation after the occurrence of the mutually beneficial relationship is better than the original adaptation, the data holding performance is updated.

The maximum number of mutually beneficial exchanges between missionaries and local officials is *trynum* of times. When the *trynumr* of mutually beneficial acts are over, the missionaries leave the local area. The ratio of the amount of data about the local by the missionary to the number of locals is calculated and is called the amount of data acquisition Rel_j .

$$Rel_j = \frac{D_m^j}{D_l^j} \tag{10}$$

If $Rel_j \geq 1$, the missionary returns to the church, reports the amount of data, adds the current city to the forbidden table, and does not send any more resident missionaries to obtain data; if $Rel_j < 1$, the missionary returns to the church, reports the amount of data, and the current city remains in the list of cities to be selected and may still be selected in the next iteration.

E. Process of TCA

1) Initialize the location and rank of n city nodes; initialize N_{ser} exploratory missionaries and N_{res} resident missionaries in a city node; initialize $trynum_{max}$ and $movenum_{max}$, maximum number of iterations t_{max}; initialize the number of iterations $t = 0$, movenum=0, trynum= 0.
2) If the maximum number of iterations $t = t_{max}$ is reached, the process ends and returns W and $f(W)$. Otherwise, the city routing table is updated and the search start point is selected for the exploratory missionaries according to (1).
3) If the number of a exploratory missionary actions reaches $movenum_{max}$ times, *movenum*=0, return to the church, report the collected city location and the corresponding amount of geo-data, and update the routing table; if the number of an exploratory missionary actions has not reached *movenum* times, search according to (3), (4), (5), and collect according to (6), *movenum*= *movenum*+1.
4) The church selects the gaming location for the resident missionary according to (1). If the resident missionary

action reaches $trynum_{max}$, then *trynum*=0, determine whether the city joins the taboo table according to (10), and return to the church with *trynum*=0; otherwise, the resident missionary plays the data game according to (7), (8), and (9).

5) Update the routing table, $t = t + 1$.

VI. Cases and Findings

This study takes the geographic data hunting from the West to the East in the 15th-16th centuries as a sample, brings together documents, canonical texts, maps, communications, publications and air and space data, and transforms and assigns spatio-temporal trajectories to the data through the analysis of the collective goals and typical character behaviors of Tessi missionaries. After data mining and data complementation, the geographic data acquisition and geographic knowledge products involving spontaneous collective synchronization processes with algorithmic constraints are formed in the production process of continuous time periods. Experiments show that we are able to form effective algorithms from dynamic data and computational reasoning. In the process of capturing evolutionary behavior and cognitive features of common knowledge, the data are automatically evaluated to generate distinctions and connections between genotypes and expressions that contribute to the efficiency, objectivity, and reliability of analysis and help reduce computational invalidation, inference interruptions, inference errors, and experimental costs.

In the long run, the interaction between locals and Tessi missionaries helps to promote the diversification of bilateral trade relations. In fact, Tessi missionaries act as trade facilitators in the first place, reducing transaction costs in export activities, enabling more local missionaries and officials to understand international trade needs, and spawning new trade relationships. data trade in geographic data acquisition by Tessi missionaries has been well tested empirically over decades of event accumulation; however, there is an absence of a traditional social computing an analytical model to predict the expected nonlinear relationship between migration and gaming in space in geo-data exchange.

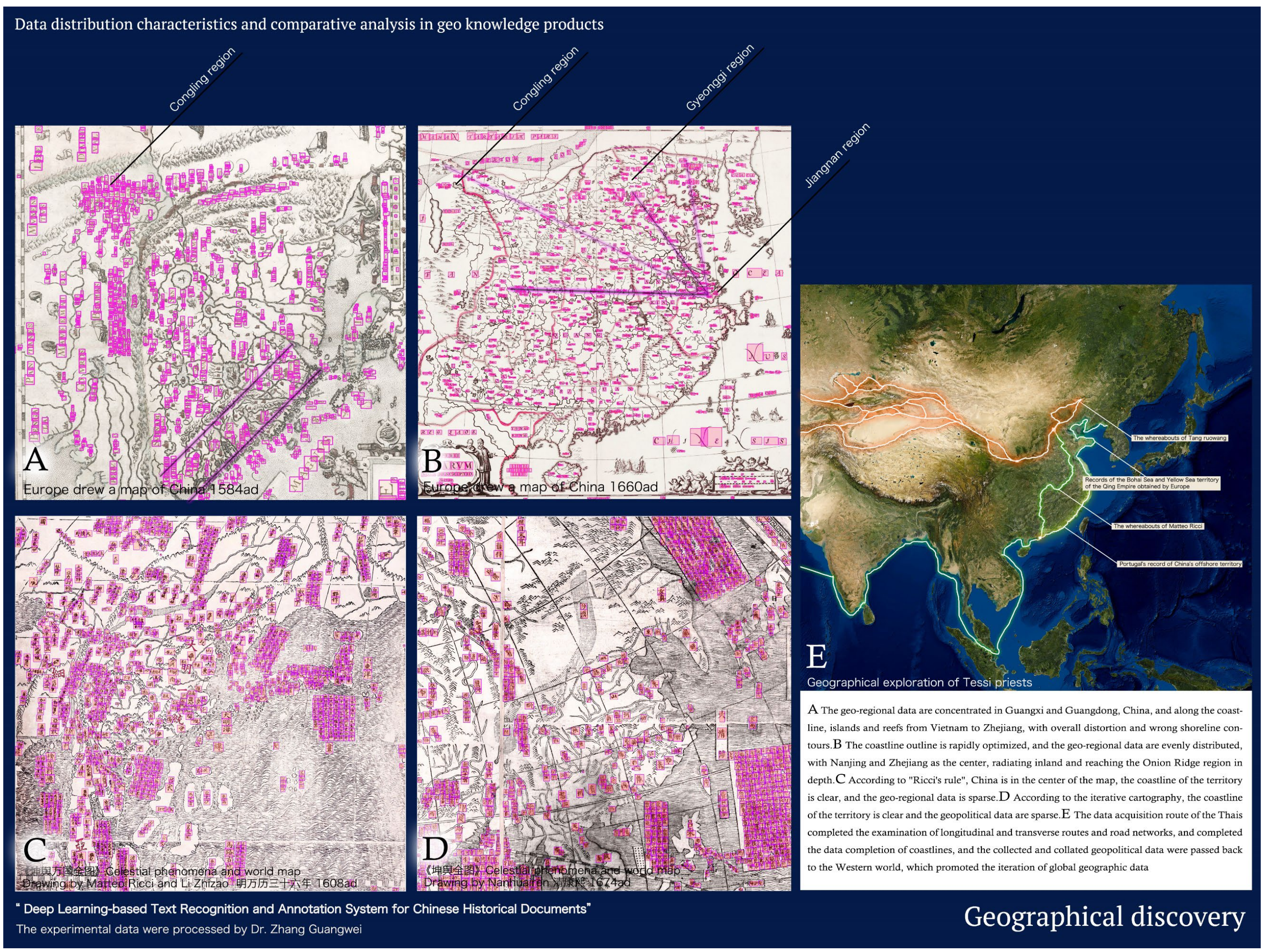

Fig. 2. Data distribution characteristics and comparative analysis in geo knowledge products.

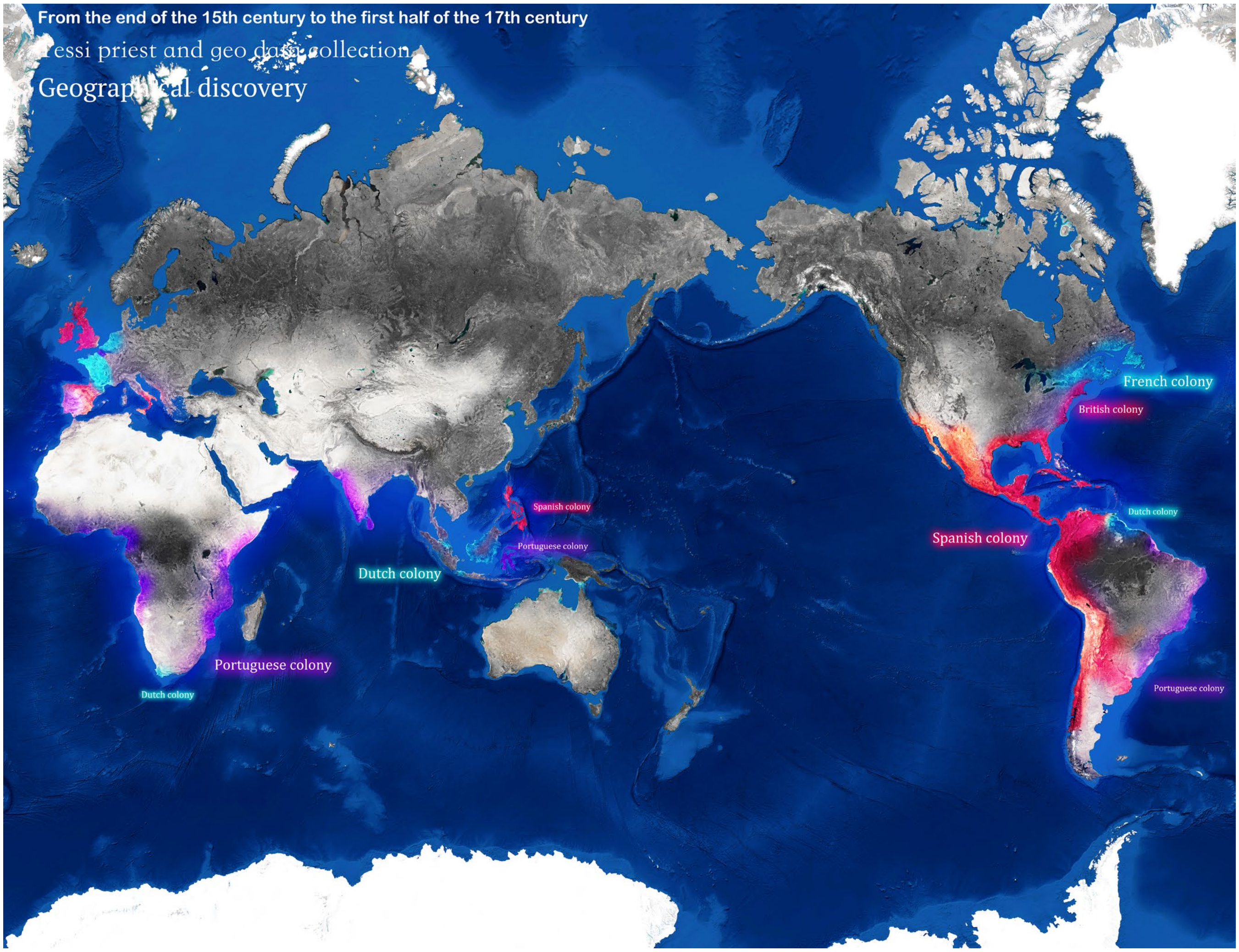

Fig. 3. Missionaries collect geographical data in colonial expansion.

The simple model developed by this algorithm suggests a positive nonlinear relationship between extensive geo-data value blindness and missionary exploration in the total area region. The algorithm description can provide support for modeling social phenomena such as the spike in the amount of valid geo-data for maps published in Western countries and missionary activity data in China during the same period as the Chinese Ming and Qing dynasties. The model also suggests that a sufficient amount of prestige needs to be accumulated before missionary interactions with geo-data owners can have any effective impact on later games. The sensitivity of the significance of the consensus on the value of solipsistic religion in the game process suggests that differences in the sense of culture and perception of power between the local clergy (a social class with basic educational qualities) and the Tessi missionaries may affect the positive or negative impact on the game process. In addition, we have investigated how missionaries constructed social ladders to achieve exposure to a very low percentage of the total population, but guaranteed to achieve an effective game of religious knowledge transmission and natural and social knowledge exchange, in which the possible relationship between the range of joint translations involved and the degree of diversity of the inter-translation portfolio, found evidence of a strong positive correlation between the two.

The current study shows that clearly identifying and defining the driving goals, relational factors and interactions of group behavior is very effective in describing and explaining group intelligence in terms of cooperation mechanisms. However, to gain analytical insight in the high-dimensional phase space, relying only on specific regional scenes, non-wide ecological events; or relying on object changes to generalize scene characteristics, non-dependent process fluctuation frequency and other analytical results, in which episodic behavior is difficult to automatically converge into a convincing understanding, still need continuous simulation-based extrapolation of experiments to effectively achieve the maximum synergistic effect of service deep learning.

It is gratifying to note that the occasional emergent variant data in the computation, with feedback from domain experts, clearly satisfy the initial design goals. Research breakthroughs that could not be directly identified or evaluated in social science domain research can be found to be convincingly understood when combined with the complement of broader domain knowledge. Current research suggests that research models for describing georeferenced data still need to continue to be constructed with increased data samples and data granularity. When reuse in related domains is required, the algorithm needs to be recalibrated with the value and role of new factors in order to describe and deduce the strategies of group intelligence in cooperative behavior.

VII. FUTURE WORK

This paper derives a simple model based on game cooperation that allows us to gain insight into the role of international trade relations in their evolution and diversification. We can identify some improvements and refinements for future related work. One aspect worth considering is the heterogeneity of targets: even within a group of people from the same country, the composition of social values and civilizational standards can be very different, ranging from transients, basic workers and unskilled people to professionals and leaders. In addition, more complex measures of game diversification are adopted to better deal with the transactional aspects.

Understanding the complexity of international data transactions (trade intelligence) is critical to issues ranging from quantifying the competitiveness of individual countries to predicting the collective evolution of the world economy. Although significant progress seems to have been made in data intelligence today with the open-source sharing of massive amounts of data, in contrast, the international trading system has been modeled primarily with single networks, such as unilateral product space networks and bilateral national product networks, to capture economic complexity [15]. The algorithms presented in this paper are not intended to apply to one-issue scenarios, but rather to provide ideas for future work to better capture more detailed behavior: e.g., describing international data transactions (trade intelligence exchange systems) as a multi-layer network, with each layer representing a demanded game relationship; revealing the nested structure within each layer and accordingly allowing us to understand alternative measures of game behavior complexity.

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