Big Data and the Rise of Land Engineering Disciplines

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Abstract. The era of big data has arrived, and big data technologies have penetrated into various industries. As an emerging discipline, land engineering has its scientificity and necessity. First of all, changes in thinking methods and methodologies have spawned big data. Second, the integration of research objects and content in land engineering requires big data. Then there is big data as a new planning and design technology, which can effectively promote the construction and development of land engineering disciplines. Therefore, it is an inevitable trend to use the innovative technical means of big data to promote the development of land engineering disciplines.

1. Introduction
In the Internet time, “the big data” already became the human society one important resources, moreover this resources assume the geometric series growth, and is affecting now human society’s development and reforming [1-2]. The Internet time “the big data” the upsurge affects to economic society each domain, the land project discipline is swiftly and violently the big data research and the application natural test facility [3]. The focusing land project discipline and big data starting with the collision, the big data the thinking mode and the methodology transformation, the land engineering research object and the content fusion as well as the plan and the design technology innovation which brings to us, the big data the opportunity and the challenge which brings for land project the research and development.

2. The Necessity of Combining Land Engineering and Big Data

2.1. Thinking mode and methodology transformation
The East and West thought pattern and the method have the difference respectively in the complex question solution aspect. The big data takes “the correlation” the relations to attenuate “the causes and effects” the relational research, pays attention to the human and the social space sensation [4], has provided the new mentality and the method for the land project discipline complexity research, breaks through the West to return to original state theory, the development whole discusses with the system...
theory. The land project is an emerging interdisciplinary studies., the object of study involves the nature, the society, the economy, the project technology and so on many factors, is the opening complex great system. The traditional land project research technique investigation experiment, the engineering project plan and the design mainly relies on “from the top downward” the theory modelling actuation, pays great attention to the physical space sensation, often through the random sampling way, then attempts with the model to return to original state the complete picture, mainly is studies the energy very great degree to concentrate in the data gain, sampling and the return to original state method, but often the monopolistic data becomes the scholarly research the core resources. But under big data actuation observation real diagnosis research, more prominent “from bottom to top” entire sample big data emergence, liberates the scholars from the collection data and the processing data, places the energy the promotion to solve with the data question ability, solution land engineering Coyne involves the factor excessively to be many, the modelling is unable with difficulty prominently “the field, the water, the road, the forest, the village” the land synthesis improvement integrity, displays the big data truly the value. The big data research and the application changed the traditional thinking mode and the methodology (Figure 1).

![Figure 1. Big data wireless sensor network technology applied to agricultural production.](image)

2.2. Land engineering research object and content fusion
The land project discipline object of study and the content are “the utilization project method solution land question, has not become using the land may using the land or using the land has carried on the highly effective use, can move the negotiator relations harmonious developing process.” Big data 4V (Volume ultra large capacity, Variety multiplicity, Velocity rapidity, Value density low) and so on characteristics, conforms to the land project discipline “to be able to move the negotiator relations” this object of study and the process. The big data has provided massively about “the human” the data, enables the human relations research to pay attention to “the human”, manifests well humanist. May from the macroscopic - intermediate perspective - microscopic and so on the levels, the dynamic revelation person's space operation and the spatial behavior pattern rule, changes the dynamic space for the land project research by the static space(Figure 2).Macroscopic stratification plane: The public relations network big data, searches the big data, the mobile communication big data, astronautics remote sensing big data gain and the application, may in the dynamic revelation land project discipline construct the urbanization and the countryside hollow dynamic development which uses to fit out, provides the scientific basis for the cities and the countryside plan and the development research as well as the land project synthesis improvement. Intermediate perspective stratification plane: The localization navigation big data, the transportation intelligence big data and so on the analysis and the application, may promulgate the cities and the countryside personnel's space and time and the behavior path, reflected the agriculture uses, the construction to use the development and the reorganization potential and the later period uses the way, provides the scientific basis for the plan and the design.
Microscopic stratification plane: The fine refinement farm machinery operation big data, the production life consumes energy the big data, the networking agricultural production big data (crops growing trend, crops output, soil body stable, soil physics and chemistry target dynamic change) and so on the analyses and the application, may promulgate the water, the earth, the gas, the fresh mechanism and the dynamic change process, for the additional farming, the additional construction provides the data and the policy-making support with the place sustainable use.

**Figure 2.** Demonstration and promotion website for comprehensive improvement and integration technology of abandoned rural house sites.

2.3. **Plan and design technology method innovation**

Under the big data actuation, the research content transformed from the static space to the dynamic space, its corresponds the plan and the design technology method also should from the static programming to the dynamic programming transformation. One of traditional land improvement plan rationales is statistics and the linear prediction model, strengthens the complex land project system day by day regarding the uncertainty, plans and designs the new technical method to be supposed to non-linear, from the organization, the high dimension complex question, the plan content to be supposed from the sole special plan to the synthesis whole plan transformation. Traditional plan tool GIS stresses on “ ” the expression and the analysis, is faces “ ” GIS, to the region person system in “the human”, namely expression insufficiencies and so on individual, community, organization, should establish based on the big data “man-machine interaction” the dynamic programming platform, the land project domain data, the information, the knowledge effective organization and the application (Figure 3), the future plan and the design work will be supposed through the dynamic programming platform, to reveal suddenly human's leading decision-making and the plan design status, will not be supposed because of the data gain and the processing insufficiency and the lag, but will affect the process and the effect which will plan and designs, will display the data fully Digs according to, the computation experiment and so on the big data technology, avoids the data only is in the plan establishment process by the fragment way appearance, crosswise lacks the coordination, longitudinal lacks the flowing, jumps out the traditional plan, in particular the legal plan pattern, extends and develops the plan the content, the actual effect and carries out the strength.
a. The compounding diagram of feldspathic sandston and aeolian sandy soil.

b. Rainfall or irrigation.

c. Crop of feldspathic sandston and aeolian sandy soil compounding matrix potential water absorption.

d. Schematic diagram of water absorption by matrix potential.

**Figure 3.** Big data simulation applications.
In brief, not only the big data brings for the land project discipline is studies the content and the technical aspect innovation, is the thinking mode and the idea transformation, is a revolution, is an opportunity [5], is important milestone which the land project discipline soars.

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