

Developing the tidal flat information system using satellite images and GIS

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Abstract: The costal area where takes up over 32% in domestic territory is considered as very importantly because it has not only economic facilities such as harbor and an industrial complex but also recreation facilities. Moreover, the tidal flat area has been used as culture ponds and salt farms because this area is occupied by various oceanic species. Also, the tidal flat area has played an important role to purify ocean pollution and maintain an ecosystem.

However, the costal ecosystem has seriously threatened by domestic reclamation projects and a large-scale tide embankment during recent 10 years in Korea. This serious problem results in loosing 34%(810km²) of the entire domestic costal area.

In this paper, the micro-landform in the tidal flat area, which is called as Garolim bay in Korea, is classified by using Landsat TM images also verified through a filed report.

Through the result of this, the tidal flat area is expected to manage efficiently especially through analyzing sediment environment and characteristic of grain size by using satellite images.

Keywords: Tidal flat, Satellite image, GIS, Unsupervised classification, Distribution characteristic

1. Introduction

The definition of tidal flat is a nearly flat coastal area, alternately covered and exposed by the tides, and consisting of unconsolidated sediments. Also, the tidal flat is regarded as the spawning ground of birds, fish and shell.

Moreover, according to previous research the 66% of oceanic species and the 90% of domestic fishery have been related to wetland directly and indirectly because most aquaculture ecosystem has been started in tidal flat. In addition, it takes an important role to maintain aquaculture ecosystem by purifying pollutant from land. In our case, the tidal flat of west coast has been known all over the world comparing the North Sea in Europe and the southeastern coast in United

Sates. However, constructing an industrial complex has destroyed our aquaculture ecosystem in domestic tidal flat.

In this study, in order to manage our domestic tidal flat efficiently and defined the distribution characteristic of it, the micro-landform of tidal flat in IWON tidal flat and Garolim bay were classified by using Landsat TM images. Also, the tidal flat information system was developed through GIS data and a field survey such as sedimentary environment and grain size characteristic.



Fig. 1 Study area (Chungnam Taean, Korea)

2. Research Method and Data

In this study to develop the coast sediment environment information management system, IWON tidal flat and Garolim where are located in Taean in Chungnam province, are selected as the study areas.

Also, Landsat TM on the 2nd of March 1999 and the digital maps scaled on 1:25,000 were used to investigate the distribution of the tidal flat and to construct GIS DB.

Moreover, to construct database and verify the characteristic classification of tidal flat, 7 field surveys between October in 1994 and October in 1995 were performed in Garolim bay and one in March in 1999, respectively.

In order to implement the system proposed here, Visual Basic 6.0, Map Object 2.0, and Access 2000 were used as Programming language, GIS component, and DBMS, respectively.

3. Images Processing and Constructing the Tidal Flat Environment Information

In order to process images properly, the digital topography map scaled on 1:25,000 and Landsat TM on the 2nd of March 1999 were run at ERDAS IMAGINE 8.5 for the geometric correction and re sampled through Nearest Neighbor method. To classify the distribution characteristic of tidal flat, ISODATA method of un classification methods was selected by clustering pixels, which have similar values. Jo Myung-Hee(2000) and Jung Jong-Chul(2002) studied the distribution characteristic of tidal flat sediment by using satellite images and verified the suitability of using satellite images for the classification of micro-geomorphology.

To clarify the distribution state of coastal tidal flat in this study, tidal mud flat and sand flat were simply classified.

To construct other environment information construction, the digital maps scaled on 1:25,000 in Taean were classified in to 28 layers such as stream, road, facility, topography, labeling and so on. Moreover, the attribute data was input by producing another layer based on the coordination extracted by GPS.



Fig. 2 System concept diagram

4. Constructing the Tidal Flat Information System

In order to implement the system GUI(Graphic User Interface), Visual Basic 6.0, Map Object 2.0, and Access 2000 were used as Programming language, GIS component, and DBMS, respectively.

The system configuration and menu were defined to main menu

such as file, view, static data, magnification, reduction, pan, attribute window, map window, thematic map controller, static data window, and sate bar as show in Fig.3.

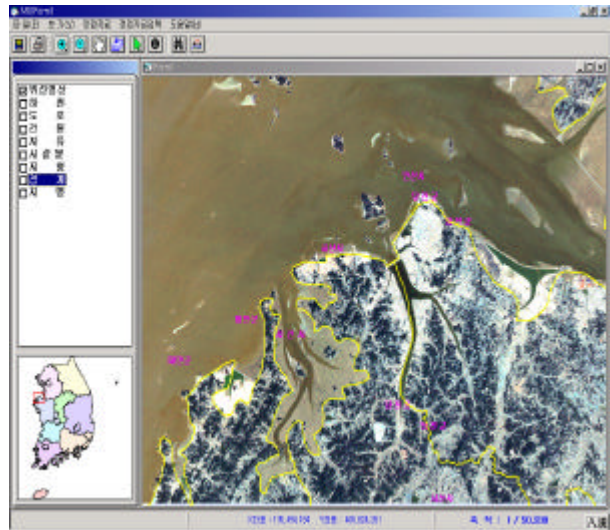


Fig. 3 Main window and image information retrieval

1. The field survey data input interface

The complex retrieval and spatial analysis could be performed through implementing the interface to operate with grain characteristic database. Especially, static data could be input in map window as point topology based on WGS-84 and TM coordination.

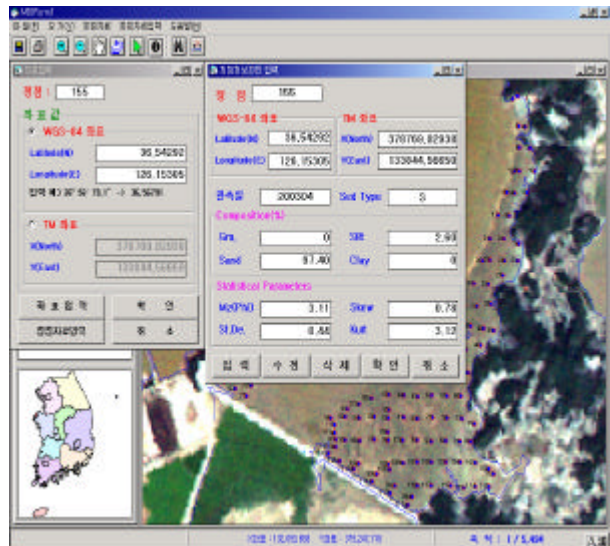


Fig. 4 Static data input & retrieval interface

2. The attribute information retrieval interface for the coast surrounding information

The attribute of static point data can be presented as graph and table so that can help users acquire the detail information in visual.

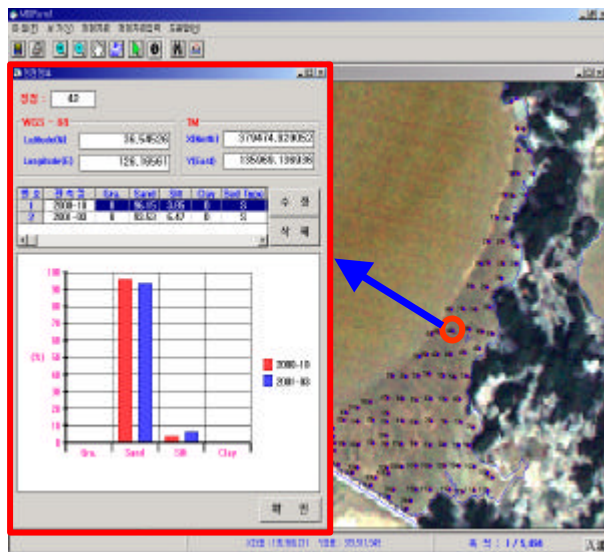


Fig. 5 Static data attribute view

3. Conclusion

Korea tidal flat has been known very famous with the eastern coast in Canada, the eastern coast in United States, the North Sea, and the Amazon. However, the tidal flat has been destroyed through building an embankment, constructing an industrial complex, reclaiming for the expansion of territory.

Because of these above reasons, there are serious problems such as a destruction of ecosystem, an environmental pollution, a loss of fishing ground. Although recently the importance of tidal flat is started to remind and studies about it are performed, there is still difficulty of managing these data.

The goal of this study is to implement the tidal flat information system through several field surveys and GIS DB. The main database and interface were designed as in very early step and then desired information could be acquired through chart, table, and map in visual

For the future works, various mapping function and detail satellite images processing will expect to be perform.

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