Introduction:
In this paper, we suggest a tele-operation control station to construct excavator system. The excavator is operated in dangerous or poor environment. For this, we wish help to develop excavator system and automatic running function of public works.
We develop excavator control skill that recognize working environment, and move autonomously without human’s help according to plan. As additional, we develop remote control technology by tele-operation.
We construct Intelligent excavator system (IES) that can apply remote control technology through.

objective:
Recently industry spot, decline of productivity and pay-ability are deepened by skilled worker's lack and problem of safety. And worker of construction machinery that work in danger or noxious work-environment has been exposed to the danger, but countermeasure is insufficient situation. In order to do that, Automation of construction machinery is best solution to solve this problem. In hazardous environment applications, Intelligent Excavator via tele-operation are very interesting issues because improve on safety and efficiency of work.
In this Paper, we suggest new type tele-operation control station for intelligent excavator. It focuses on tele-operation using 3-D stereo display monitoring system, and electronic excavator for experiment. In additional to, we verify remote control and Automatic working of excavator.

methods:
We developed tele-operation control station for excavator system. The system is consisted of 3-Monitor to display image information through stereo-scopic camera module. Middle monitor is appeared in stereoscopic image through stereo camera. Stereoscopic image is made by horizontal migration of two lenses in stereo camera. Interlaced images of right and left can see as stereoscopic images using a polarizing glasses. The stereoscopic image is useful that a operator recognize monitor images as real environment. The Side monitor is installed in mono-camera. Side monitor helps that a worker can see wide-view.
This images receive from stereoscopic camera that the module installed to excavator. It helps that a worker can recognize working environment in industry spot.
Control panel is consisted of 3-computer system. Each computer has functions about sensing information detection, simulation, a state of excavation information detection. Each panel was named sensing-control panel, simulation panel, and excavator-state panel.
Sensing-control panel controls excavator’s obstacle avoiding and location judgment. Simulation Panel displays excavator form of imagination. Through simulation, worker can forecast excavator state even if do not get into.
Excavator’s remote control of simulation control panel is available through multi axis joystick. Excavator-state panel takes the place of excavator’s GP. It presents engine speed, engine cool water thermometer, fuel gauge, engine oil pressure warning light, digital clock, date, etc. 3-control panel has been connected each other, and acts as feedback in excavator intelligence control. Monitoring system is constructed by 3-monitor and control panel. The control command data transmission between Wireless control station and Robot excavator is achieved by wireless TCP/IP modem. Through the modem, working environment image data and excavator control data are transmitted. Wireless TCP/IP modem line-of-sight is about 10Km using omni-directional antennas.

Results:
For the tele-operation control system, we developed 3-D camera module and monitoring system, wireless data transfer system, control system mock-up. Using this system, we applied to real excavator system. The result from field test is very successful. However, we found communication delay between control station and excavator system.

Conclusions:
Remote control using this developed system and automatic running for Intelligent excavator system was conducted. This work performed stable movements through tele-operation Control Station. Simulation results show that operation error was reasonably small. When the operator works in hazardous and dangerous environment, the IES(intelligent Excavator System) which used tele-operation Control Station is useful system in aspect of safety and efficiency.
Fig. 2 3-D camera system

Fig. 3 Interaced image using stereo camera
Fig. 4 Wireless transfer system