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Observation System for Transient Phenomena and Weather Forecast on Sensor Network

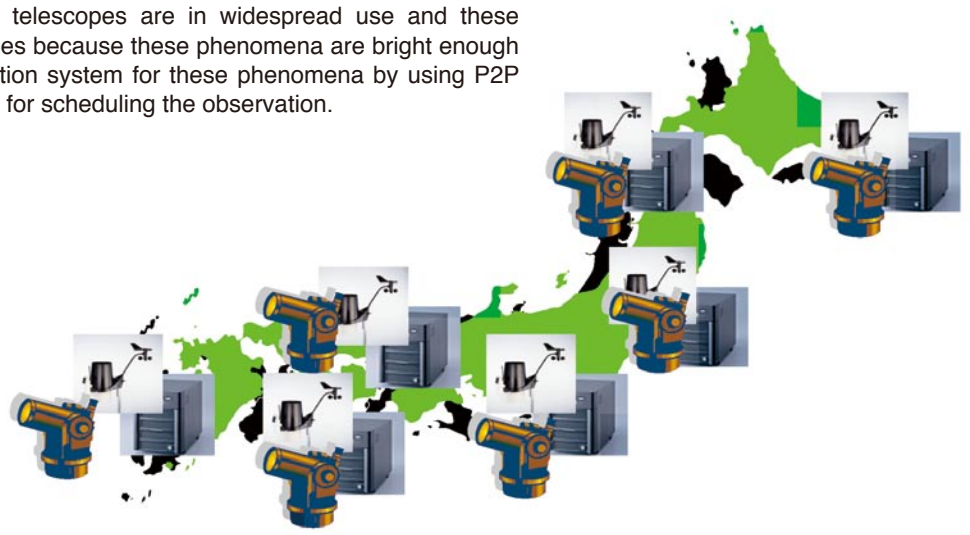
Hyogo University of Health Sciences

Introduction

Transient phenomena such as super novae and gamma-ray bursts often occur in our universe. However, it is difficult to get the first few minutes of data because we cannot predict when these phenomena occur. On the other hand, small telescopes are in widespread use and these phenomena can be observed by these telescopes because these phenomena are bright enough to observe. We present a cooperative observation system for these phenomena by using P2P infrastructure and a weather forecasting system for scheduling the observation.

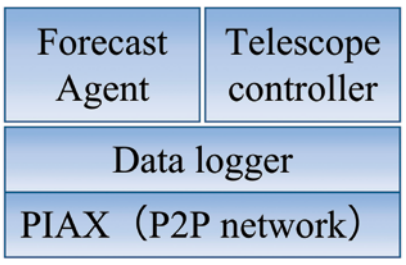
P2P Platform

We adopt the P2P architecture as our application platform for controlling many telescopes, images and weather sensor data. In general, discovering the data effectively is difficult. We use PIAX (P2P InteractiveAgen eXtensions, http://www.piax.org/) as a platform. PIAX, which is developed by Osaka University, can search and get data on the basis of its location information effectively by DHT and LL-Net.

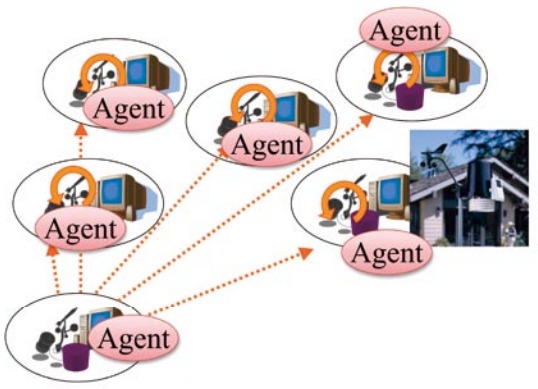


Observation and Weather Forecasting System

We built a system for controlling the telescopes and imaging devices and forecasting the local weather by weather sensor data. In order to schedule observations, knowing the local weather information is necessary. But the local weather changes during 10 minutes order. So we use not only public information but also the local weather sensor data. We collect the weather data by a mobile agent implemented by PIAX and predict the local weather by AR (auto-regressive) model and interpolate the data at certain points. We schedule the observation by these information and get the image data of the phenomena.

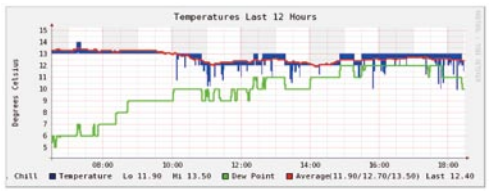


Software architecture of each peer

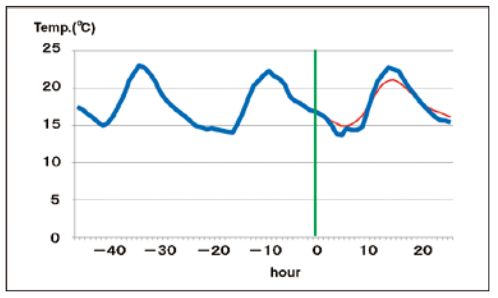


Behavior of mobile agent

Example: multiple weather sensor data

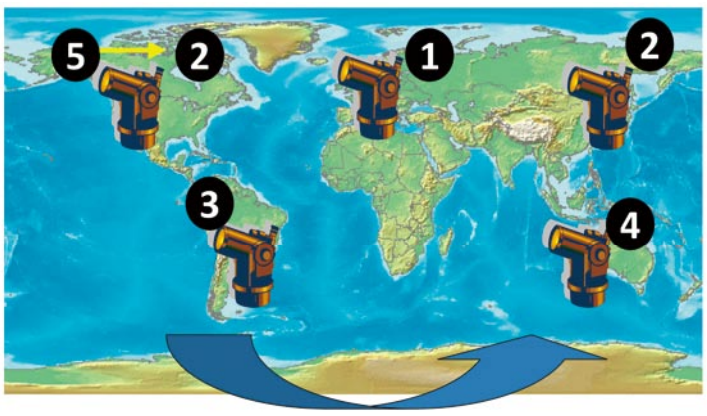


Data collection by P2P agent
The agent predicts the weather by using the historical data



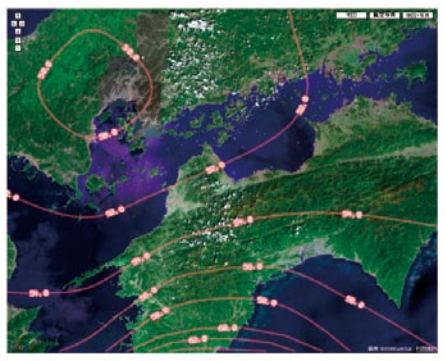
Blue: original data　Red: predicted data

Get forecast information at the any point by interpolation



Case: 24 hours cooperative observation network

Decision of observation schedule in accordance with the weather forecast information



Interpolated map of weather data

Contact : Seiichi Kato, Ph.D.
E-mail : katosi@huhs.ac.jp