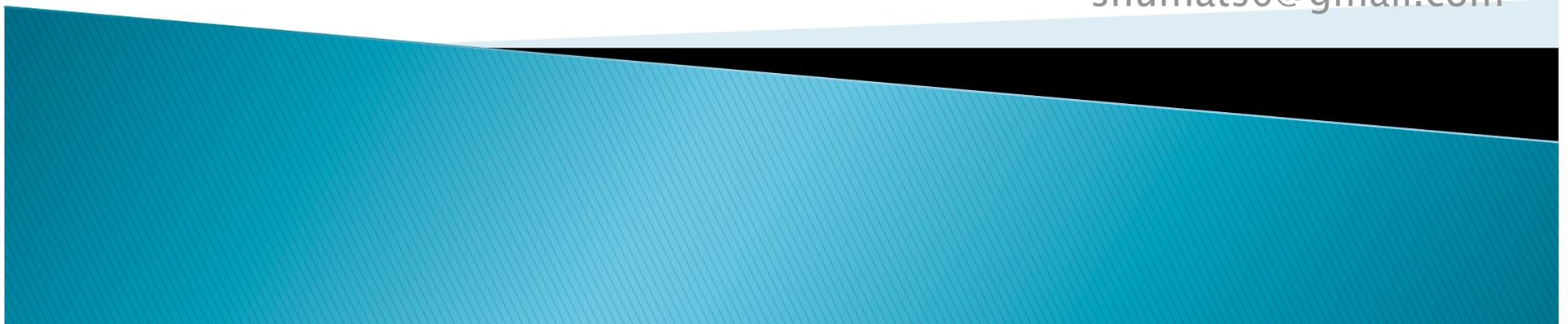


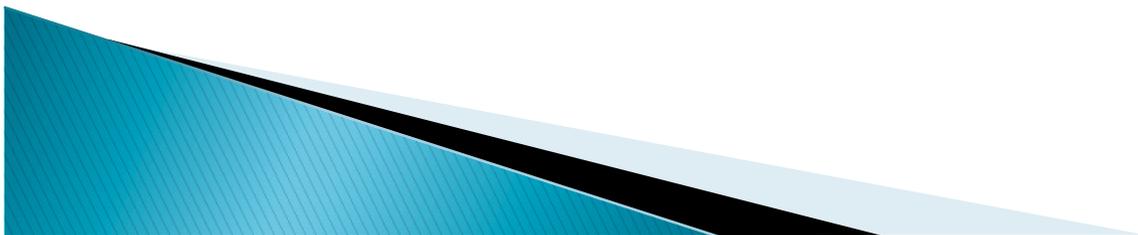
Development of a Constellation Topic Map Application Controlled by WiiRemote

Kimitaka Amano, Konosuke Kawarasaki, Satoshi Waki, Shu Matsuura.
Tokyo Gakugei University, 4-1-1 Nukuikita, Koganei, Tokyo
184-8501, Japan.
shumats0@gmail.com

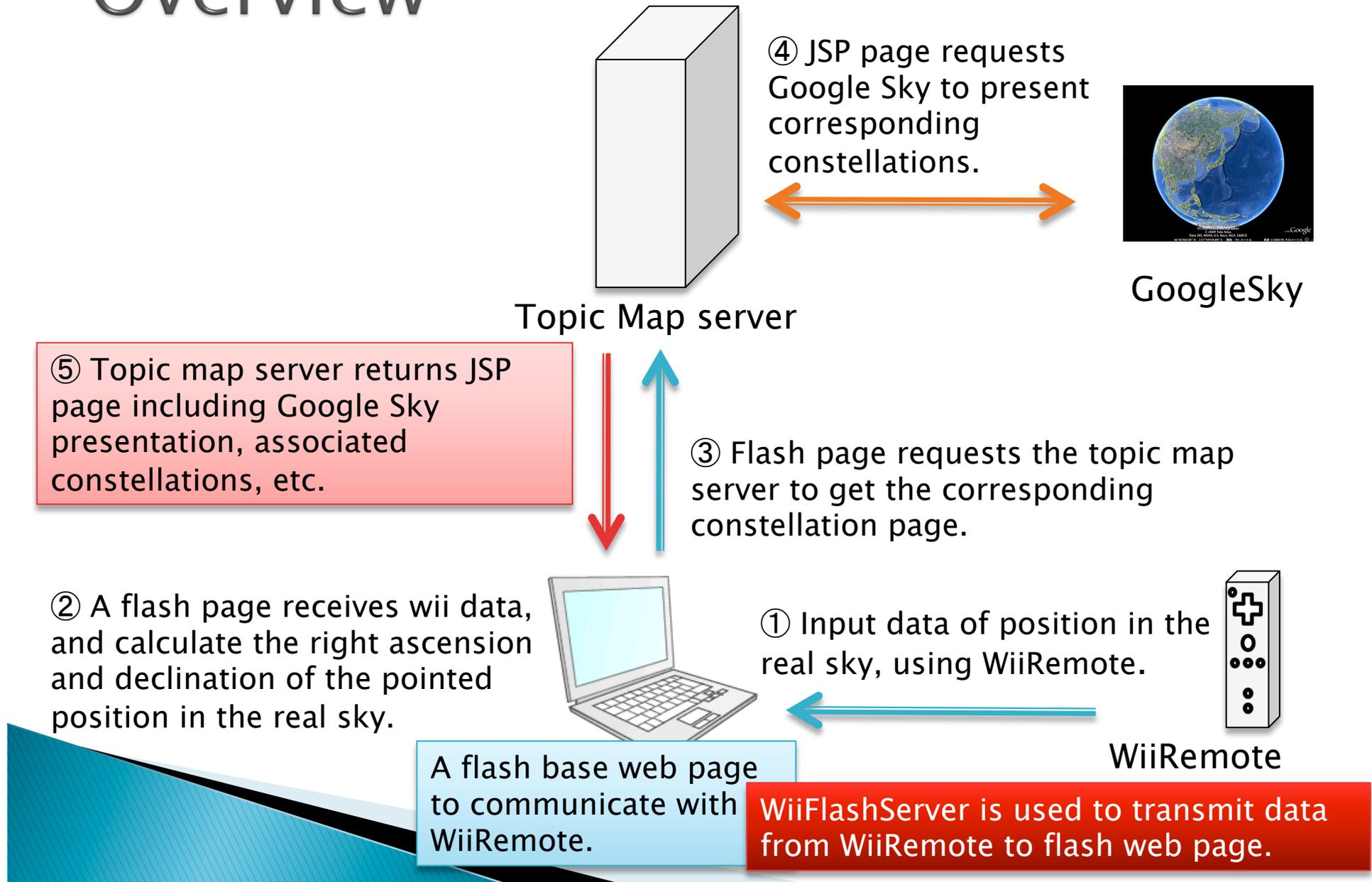


Purpose

- ▶ We are developing a multi-field study portal that is driven by a topic map. This portal includes topics of constellation.
- ▶ In this study, a system to connect real sky with online resources of constellation is developed.
- ▶ The WiiRemote, which is a popular video game interface, is utilized as an interface, to transmit the data of sky position.
- ▶ Google sky displays constellations that exist around the pointed position in the real sky, and the related topics are exhibited using topic map functionality.



Overview



Data acquisition

Latitude: request place topic page with Google Map presentation and carry out geocoding on this page.

Azimuth: measure by magnetic compass.

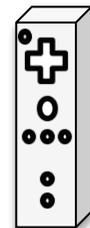
Elevation: measure by the WiiRemote acceleration sensor.

Above values are input and send to web page by pushing WiiRemote buttons. WiiRemote transmit data to PC via bluetooth.

Present time: PC time.



Entering data via bluetooth.



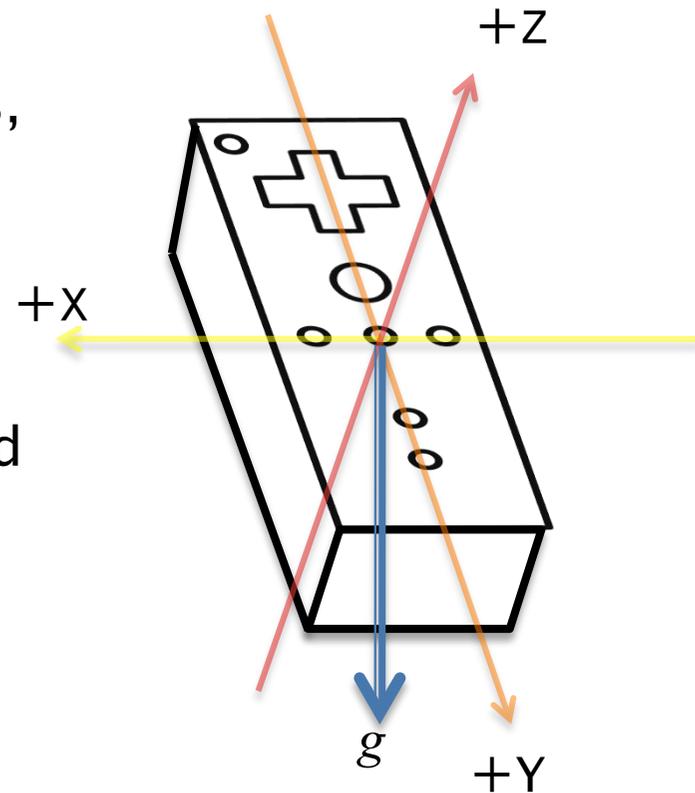
WiiRemote

WiiFlashServer is used to transmit data from WiiRemote to flash web page.

Obtaining on elevation angle from the horizon

WiiRemote transmits the values of acceleration in the directions of three axis, to PC via bluetooth.

If it is set still, acceleration sensor detects gravitational acceleration g , which works as a fixed direction to determine a pointed direction of WiiRemote.



Obtaining on elevation angle from the horizon

Angle of elevation θ from the horizon is calculated by a Flash web application from the component values of gravity projected on the three axis of Wiiremote, g_x , g_y , and g_z , as,

$$\theta = -\arctan \left(\frac{\sqrt{g_x^2 + g_y^2}}{g_z} \right)$$

WiiMotePointer - obtain the location in the sky and retrieve constellation information by Wii controller -
http://tm.u-gakugei.ac.jp:8080/epw/WiiMotePointer.html

Wiiリモコンとコンパスを用いて天空間の星座の情報を検索します

PCにWiiリモコンの接続にBluetoothが、WiiリモコンこのFlashアプリケーションの通信にWiiFlashServerのインストールが必要です。
はじめにWiiリモコンにWiiFlashをインストールしてから、このページをロードしてください。動作が非常に遅くなりはじめたら、一度
WiiFlashServerを再起動して、やり直してください。

First, find latitude by a compass, and set the value below.
Set latitude value below.
Latitude from North degree
Push right button to increment 1.
Push left button to decrement 1.
Push up button to increase 10.
Push down button to decrease 10.

Second, find azimuth by a compass, and set the value below.
Azimuth from North Label
Push + button to increment 1.
Push - button to decrement 1.
Push 1 button to increase 10.
Push 2 button to decrease 10.

Third, direct wii controller to sky to get elevation value, and press B button (backside) confirm the v value below.

Battery level : 0.445
Elev 1(x,y,z) : 48.30674568722112
Elev 2(pitch) : 46.58669492360347
Elevation : 48.30674568722112
Azimuth : 150
Latitude : 36
Local time : Thu Jan 28 19:05:25 GMT+0900 2010
Right ascension : 211.24393877505565

Finally, push home button to show sky!

WiiMote successfully connected

Copyright:
This software is a modification of WiiMoteDemo.fla which is bundled with the freeware "WiiFlash" created by Joa Ebert and Thibault Imbert.
http://wiiflash.bytearray.org/
Below is the original copyright notice:
Copyright (c) 2008 Joa Ebert and Thibault Imbert
Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:
The above copyright notice shall be included in all copies or substantial portions of the Software.

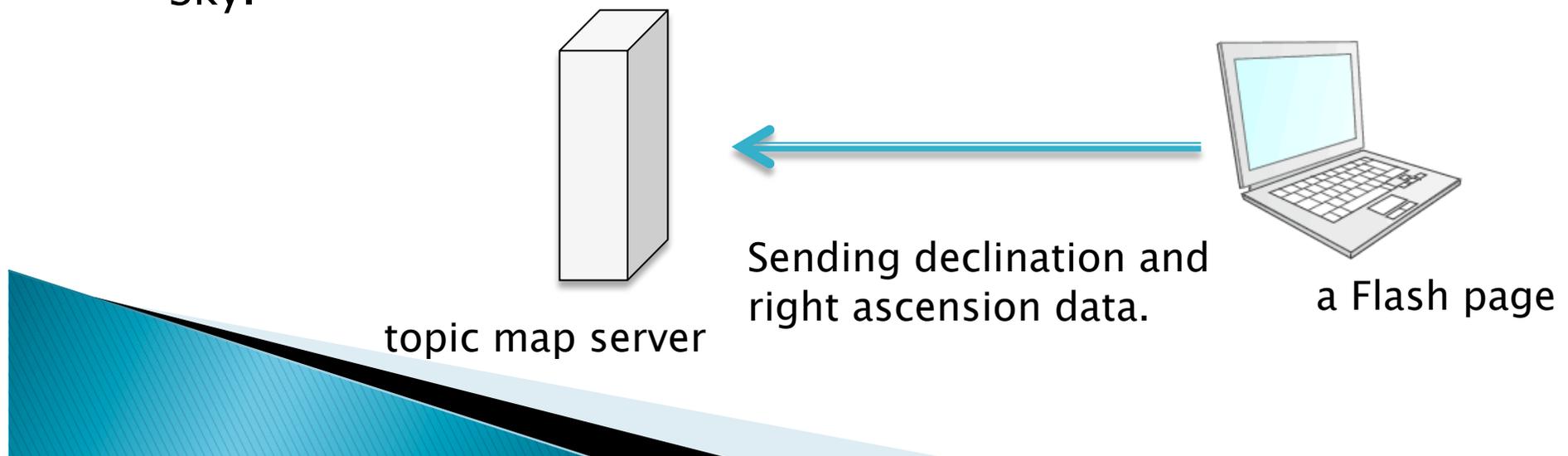
Right ascension and celestial declination

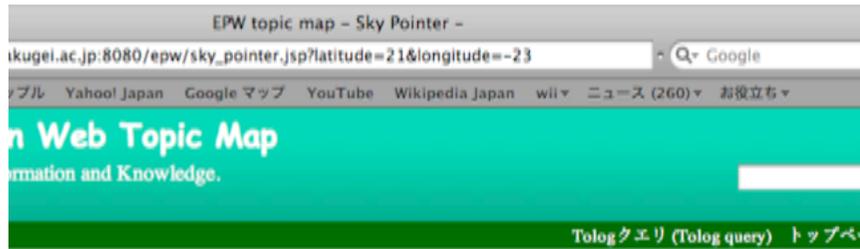
- ▶ The right ascension and the celestial declination are the longitude and latitude of the position on the celestial sphere.
- ▶ Latitude, the elevation, azimuth, and local sidereal time are required to calculate the right ascension and the celestial declination.
- ▶ Sidereal time is calculated from present time and place.



Sending latitude and longitude data

- ▶ The values of declination and right ascension are calculated by a Flash page, and are sent to sky_pointer.jsp page , to render the constellation map using Google Sky.
- ▶ The center of the rendered image of Google Sky is set to be the position that WiiRemote pointed . The instances of constellations which are included within the range ± 40 degrees are loaded and exhibited below the image of Google Sky.





Screen shot of sky_pointer.jsp.

Google Sky

declination(赤緯) = degree

right ascension(赤経) = degree

The values of right ascension and celestial declination provided by WiiRemote interface.

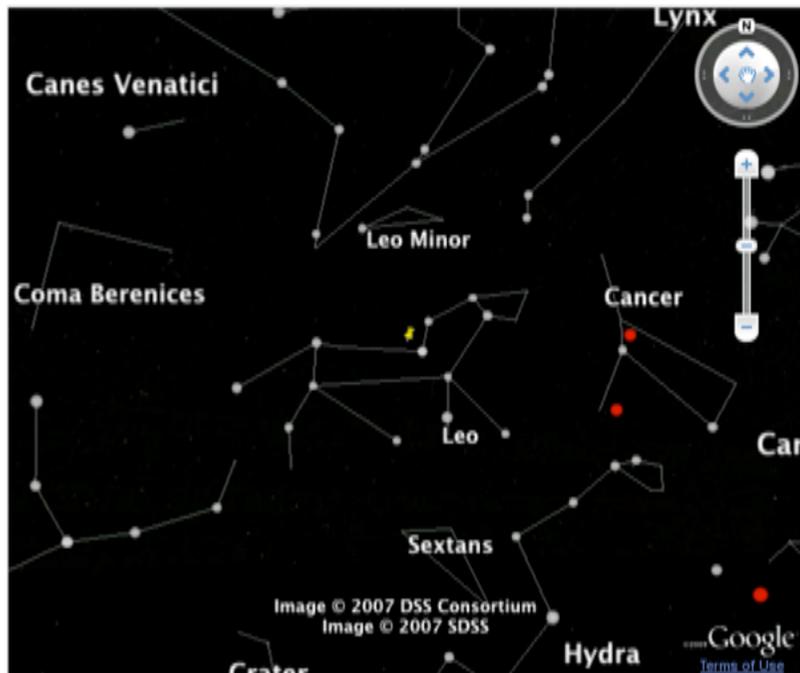


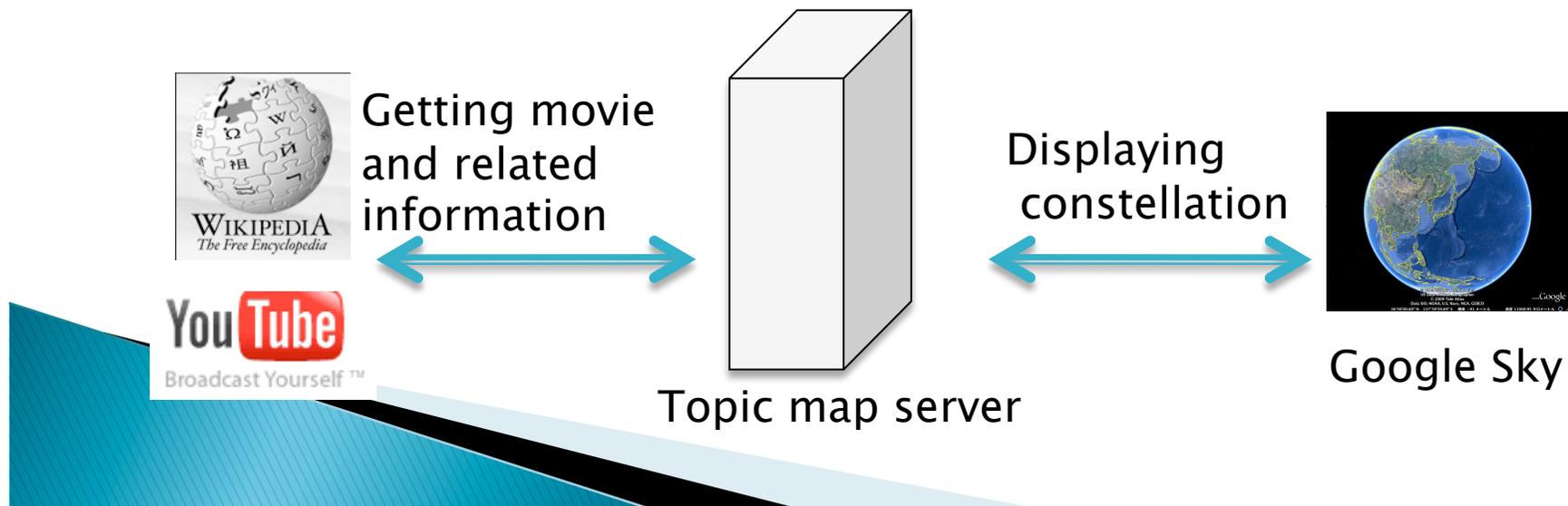
Image of Google sky

- [Cancer](#) かに座((110 - 90) degree, (135 - 180) degree)
- [Canes Venatici](#) りょうけん座((130 - 90) degree, (195 - 180) degree)
- [Canis Minor](#) こいぬ座((095 - 90) degree, (120 - 180) degree)
- [Coma Berenices](#) かみのけ座((112 - 90) degree, (191 - 180) degree)
- [Cancer](#) コップ座((074 - 90) degree, (165 - 180) degree)
- [Leo](#) しし座((105 - 90) degree, (165 - 180) degree)
- [Leo Minor](#) こじし座((125 - 90) degree, (150 - 180) degree)
- [Lynx](#) やまねこ座((135 - 90) degree, (120 - 180) degree)
- [Sextans](#) ろくぶんぎ座((090 - 90) degree, (150 - 180) degree)
- [Ursa Major](#) おおぐま座((145 - 90) degree, (160 - 180) degree)
- [Virgo](#) おとめ座((086 - 90) degree, (195 - 180) degree)

Links of constellation topics included range that is described

Mashup

- ▶ Topic map associates topics of constellation, mythology YouTube videos, etc., semantically.
- ▶ Topic map utilize Google Sky to render the requested constellations.



Future problems

- ▶ More topics to associate.
- ▶ Continuous pointing by WiiRemote.
- ▶ Change of time and seasons at the same position in the sky.
- ▶ Feedback to the WiiRemote from topic map server.
- ▶ 3D navigation.
- ▶ Drill resources for learning.

