

ICE Telescope

—

A ROS package

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Version 0.1

Abstract

ice_telescope is a ROS package to operate and remote control the telescope system at the ICE building in the UAB Campus. The full system is composed of a Meade LX200GPS telescope, an SBIG ST-7 CCD camera and a Baader Planetarium dome.

1 Synopsis

ROS

roscore

Server

roslaunch ice_telescope ice_telescope.launch

Client

roslaunch ice_telescope ice_telescope.launch action [params]

2 Description

ice_telescope is composed of several nodes –*ice_telescope_node*– that allow the control of the telescope system. Each of the system components (telescope, dome, ccd) has a pair of client–server nodes following the naming convention *brand_server* and *brand_client*:

Telescope *meade_server* and *meade_client*.

CCD *sbig_server* and *sbig_client*.

Dome *baader_server* and *baader_client*.

The server node runs continuously waiting for petitions from the client node. When a client node's petition is received by the server node, the server processes the petition, sends a response back to the client and returns to the waiting mode. The client waits for the server response and finishes the execution.

Client node

The **action** parameter issues the desired order to the server.

[**params**] will depend on the system component and the selected **action**.

Note: *roscore* must be running at all times for node communication and interoperation.

3 Servers

The servers for all the system elements are executed without additional parameters and they must be running to listen to the clients commands.

Telescope

```
roslaunch ice_telescope meade_server
```

CCD

```
roslaunch ice_telescope sbig_server
```

Dome

```
roslaunch ice_telescope baader_server
```

4 Telescope client

The telescope client issues the user's desired actions to perform with the Meade LX200GPS Telescope.

```
roslaunch ice_telescope meade_client action [params]
roslaunch ice_telescope meade_client.py action [params]
```

4.1 Options

The *action* parameter is the command to be sent to the server. The *action* can be one of the following:

- | | |
|---------------------------|---|
| <i>goto</i> | Point the telescope to the specified coordinates.
<pre>roslaunch ice_telescope meade_client goto ra dec</pre> <ul style="list-style-type: none">• ra Right ascension as a double value.• dec Declination as a double value. |
| <i>messier</i> | Point the telescope to the selected catalog object. |
| <i>star</i> | <pre>roslaunch ice_telescope meade_client messier objectNum</pre> |
| <i>deepsky</i> | <pre>roslaunch ice_telescope meade_client star objectNum</pre> <pre>roslaunch ice_telescope meade_client deepsky objectNum</pre> <ul style="list-style-type: none">• objectNum The catalog number for the desired object. |
| <i>gps</i> | Update the system's gps. Note: The dome must be open for the gps sync.
<pre>roslaunch ice_telescope meade_client gps</pre> |
| <i>getobjradec</i> | Get the coordinates of the currently selected object.
<pre>roslaunch ice_telescope meade_client getobjradec</pre> |
| <i>gettelradec</i> | Get the telescope's current pointing coordinates.
<pre>roslaunch ice_telescope meade_client gettelradec</pre> |
| <i>getdatetime</i> | Get the telescope's current date and time.
<pre>roslaunch ice_telescope meade_client getdatetime</pre> |
| <i>setdatetime</i> | Set the telescope's date and time to the current ones.
<pre>roslaunch ice_telescope meade_client setdatetime</pre> |
| <i>getlatlon</i> | Get the telescope's latitude and longitude.
<pre>roslaunch ice_telescope meade_client getlatlon</pre> |

setlatlon Set the telescope's latitude and longitude.

roslaunch ice_telescope meade_client setlatlon lat lon

- **lat** The current latitude as a double value.
- **lon** The current longitude as a double value.

focus Move the telescope's focus (in/out). WORK IN PROGRESS.

5 CCD client

The CCD client issues the user's desired actions to perform with the SBIG ST-7 CCD.

```
roslaunch ice_telescope sbig_client action [params]
roslaunch ice_telescope sbig_client.py action [params]
```

5.1 Options

The *action* parameter is the command to be sent to the server. The *action* can be one of the following:

capture Start an exposure and save the result to file.

```
roslaunch ice_telescope sbig_client capture filePath fileType imgCount imgType expTime
readoutMode top left width height fastReadout dualReadoutChannel
```

- **filePath**: The path for the saved image files.
- **fileType**: FITS or SBIG file formats.
- **imgCount**: Number of exposures to take.
- **imgType**: LF (light frame) or DF (dark frame).
- **expTime**: Number of seconds (or fraction of second) of exposure.
- **readoutMode**: Binning. Options: 1x1, 2x2, 3x3.
- **top**: Starting position in the 'Y' axis.
- **left**: Starting position in the 'X' axis.
- **width**: Image width in pixels.
- **height**: Image height in pixels.

Note: If all params (top, left, width and height) are zero, the full size of the CCD image is used.

- **fastReadout**: 1 for fast readout and 0 for normal readout.
- **dualReadoutChannel**: 1 for dual channel readout and 0 for single channel readout.

settemp Enable or disable the cooler to achieve the desired temperature for the CCD.

```
roslaunch ice_telescope sbig_client settemp enable temperature
```

- **enable**: 1 to enable and 0 to disable.
- **temperature**: double value with the desired temperature

gettemp Query the CCD temperature. The server returns the temperature, the power applied to the CCD as a percentage (0-1) and the cooler status (enabled/disabled).

```
roslaunch ice_telescope sbig_client gettemp
```

6 Dome client

The dome client issues the user's desired actions to perform with the Baader Planetarium Dome.

```
roslaunch ice_telescope baader_client action
roslaunch ice_telescope baader_client.py action
```

6.1 Options

The *action* parameter is the command to be sent to the server. The *action* can be one of the following:

open Open the dome.

```
roslaunch ice_telescope baader_client open
```

close Close the dome.

```
roslaunch ice_telescope baader_client close
```

status Query the dome status. The possible states for the dome are: open, closed, moving and unknown.

```
roslaunch ice_telescope baader_client status
```

7 Files

<code>meade_server</code>	C++ implementation of the telescope server.
<code>meade_client</code>	C++ implementation of the telescope client.
<code>meade_client.py</code>	Python implementation for the telescope client.
<code>sbig_server</code>	C++ implementation of the CCD server.
<code>sbig_client</code>	C++ implementation of the CCD client.
<code>sbig_client.py</code>	Python implementation for the CCD client.
<code>baader_server</code>	C++ implementation of the dome server.
<code>baader_client</code>	C++ implementation of the dome client.
<code>baader_client.py</code>	Python implementation for the dome client.

8 Example

```
$ roscore &

$ roslaunch ice_telescope baader_server &
$ roslaunch ice_telescope sbig_server &
$ roslaunch ice_telescope meade_server &

$ roslaunch ice_telescope baader_client open
$ roslaunch ice_telescope sbig_client settemp 1 10.0
$ roslaunch ice_telescope meade_client gps
$ roslaunch ice_telescope meade_client setdatetime
$ roslaunch ice_telescope meade_client messier 31
$ roslaunch ice_telescope sbig_client capture /img/ FITS 10 LF 30.0 1x1 0
    0 0 0 1 1
$ roslaunch ice_telescope baader_client close
```

9 See Also

ROS, *roslaunch*, *roscd*, *rosls*, *catkin_make*.

10 Requirements

ROS Environment *ice_telescope* requires ROS version $\geq 1.11.13$ (\geq Indigo distribution).

ROS Workspace If you want to compile or install the distributed system, you need a *catkin* workspace.

11 Changes

Please check the file **CHANGES** for the list of changes and acknowledgment to people contributing bugfixes or enhancements.

12 Version

Version: 0.1 of October 14, 2015.

13 License and Copyright

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The actual version of *ice_telescope* may be found on the following link
<http://www.ice.csic.es/>.

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