Visualization in ROSproessingjs

Sungmin Lee

Brown University
Department of Computer Science

Visualization of Robot's side

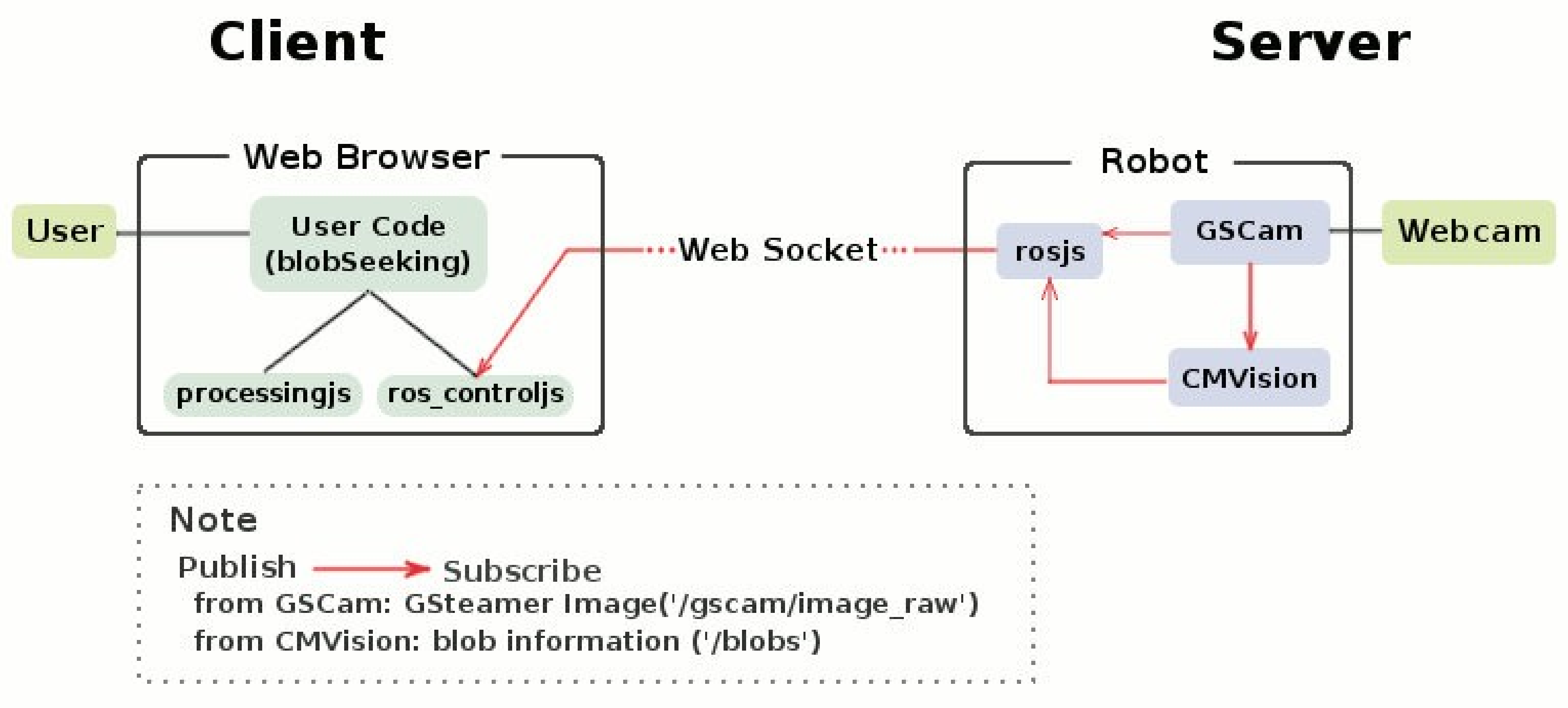
- One of fundamental ideas of Processing is easy visualization.
  - Of course using internal processing functions is still easy, but..
- How do we visualize what robot sees on our client machine(browser)?
  - Remember that it is available subscribing everything as long as it is currently publishing.
  - Subscribing is the key!

Subscribing GStreamer message

- If you once publish GStreamer message from a robot, you can subscribe it on your client.
- In fact, the publish message is NOT necessarily to be GStreamer as long as the type of publish message is ***rgb***.
  - Fortunately, "`sensor_msg::Image`" uses rgb data type.
- Another important point is that you should access `<msg_name>.`***`uri`***, not just `<msg_name>`.
  - Examples are ready.

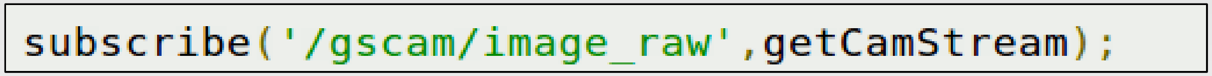
Subscribing GStreamer message

- Here is an abstract structure how it works.
- As you see, you could freely communicate with the server by using `publish()` and `subscribe()` functions.



Sample Code: subscribe GStreamer

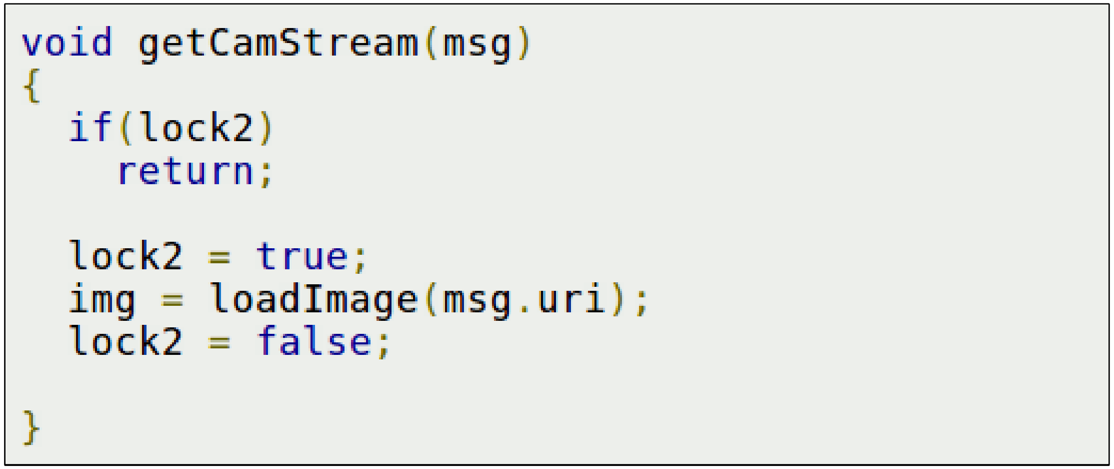
- First of all, you should subscribe the message.



```
subscribe('/gscam/image_raw',getCamStream);
```

- This function means your program will repeatedly call `getCamStream()` function which has '`/gscam/image_raw`' as an argument.

- Thus, your `getCamStream(msg)` would look similar to this:

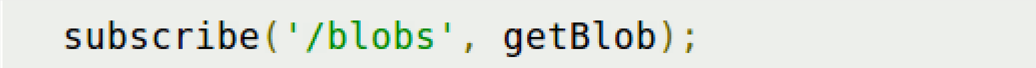


```
void getCamStream(msg)
{
  if(lock2)
    return;

  lock2 = true;
  img = loadImage(msg.uri);
  lock2 = false;

}
```

- Where `loadImager(rgbdata)` is an internal processing function which converts `rgb data` to `Pimage` data type.

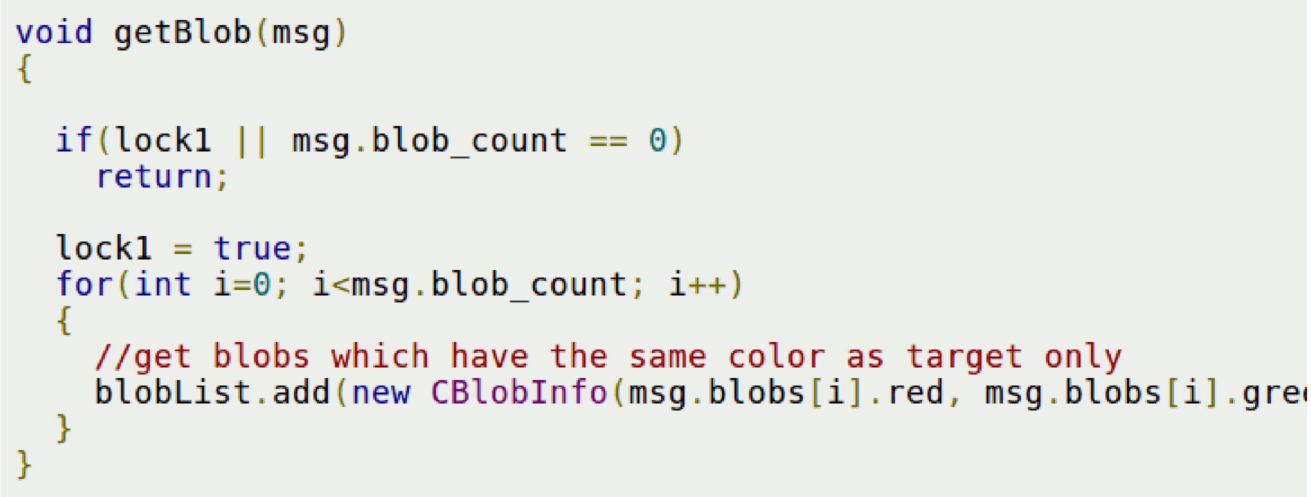
Example #1: Object Seeking (1/2)

- In the same way, you can also get blob information from the robot side by subscribing '/blobs' message.



```
subscribe('/blobs', getBlob);
```

- This subscribe function will call getBlob() function repeatedly, and getBlob() function should pass the message to local variables.



```
void getBlob(msg)
{

  if(lock1 || msg.blob_count == 0)
    return;

  lock1 = true;
  for(int i=0; i<msg.blob_count; i++)
  {
    //get blobs which have the same color as target only
    blobList.add(new CBlobInfo(msg.blobs[i].red, msg.blobs[i].gre
  }
}
```

- Where blobList is an ArrayList of CblobInfo class which contains every single blob datum of each frame.

Example #1: Object Seeking (2/2)

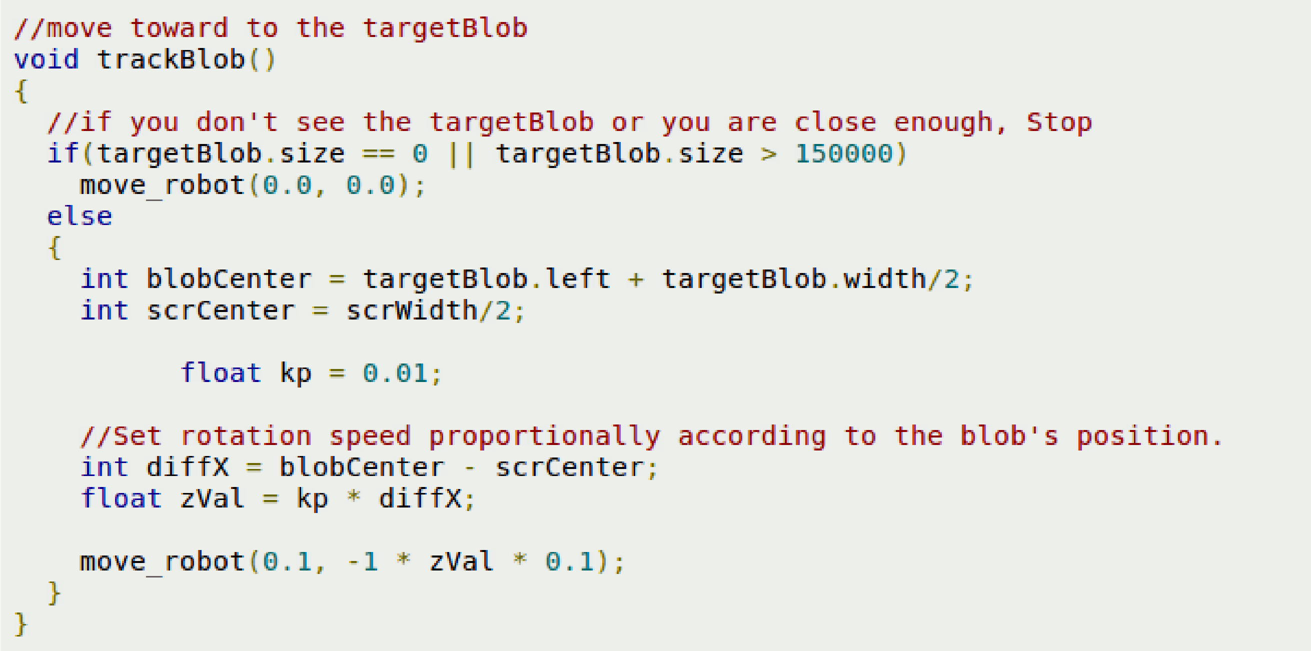
- The full code and detail explanation of object seeking is available on Brown wiki page.

- Also, Youtube video clip is also available here:

  http://www.youtube.com/watch?v=ZyQ96GDJft4&feature=player_embedded

Example #2: Object Tracking (1/2)

- You can also publish your movement by calling `move_robot(x, z)` function which is a wrapping function of `'geometry_msgs/Twist'` publisher.
- By doing that, you can interactively move your robot based on the location of blobs.



```
//move toward to the targetBlob
void trackBlob()
{
  //if you don't see the targetBlob or you are close enough, Stop
  if(targetBlob.size == 0 || targetBlob.size > 150000)
    move_robot(0.0, 0.0);
  else
  {
    int blobCenter = targetBlob.left + targetBlob.width/2;
    int scrCenter = scrWidth/2;

          float kp = 0.01;

    //Set rotation speed proportionally according to the blob's position.
    int diffX = blobCenter - scrCenter;
    float zVal = kp * diffX;

    move_robot(0.1, -1 * zVal * 0.1);
  }
}
```

- Where `targetBlob` is a class which contains the biggest blob data so that robot can track it.

Example #2: Object Tracking (2/2)

- The full code and detail explanation of object tracking is available on Brown wiki page.

- Also, Youtube video clip is also available here:

  http://www.youtube.com/watch?v=8IzGQXdKblE&feature=player_embedded

Limitation and extension

- One of the biggest limitations of Processingjs is that you cannot use java libraries such as openCV, openGL since it is a pure javascript.
- However, it also means that you may use all the internal functions of Processingjs without limitation to display things on your browser very simply.
- It is encouraged to make an importable ROS processing library(java) so that we could use all the java libraries for ROS visualization.