Why do we use color spaces other than RBG?

Using RGB color space to segment these images was quite difficult as RGB values face difficulties when the images have variations in lighting. For example, the buoys have slightly different RGB values depending on how the light from the surface hits them. A shadow would cause a dark red and light would create a brighter red. Both of these colors have very different RGB values. The major difficulty was in heuristically experimenting threshold values to determine probability ranges of the different colored buoys. In contrast, the use a color space such as HSV would be more adaptive to the changes in the images such as lighting, shadow or any such noises. The hue would stay relatively constant for the buoys, the differences in lighting would be represented through the value component and the “colorfulness” of the each color through the saturation component. The hue and saturation values remains stable, despite the changes in lighting. This would make it much easier to detect buoys as there would be a more defined region for the buoy.

Alternative color space

An alternative to the conventional, RGB and HSV color space would be RGBY (Red Green Blue Yellow). This color space would add an additional value to the image at includes a yellow layer. This additional yellow layer would provide many benefits over the traditional RGB space. First and foremost, it would provide clear identification of the yellow color. One issue that we ran into when running the 3D Gaussian was false detection of the green buoy. Since yellow is a combination of red and green layers, sometimes the yellow buoy would be recognized as a green buoy if the green tint was too high. Additionally, the addition of the yellow layer would allow for the noise that occurs from sunlight (and other light sources) since it is generally a yellow tint. This could help with the problem we faced where the RGB values would change based on the light, as it would simply adjust the yellow more than the RGB values.