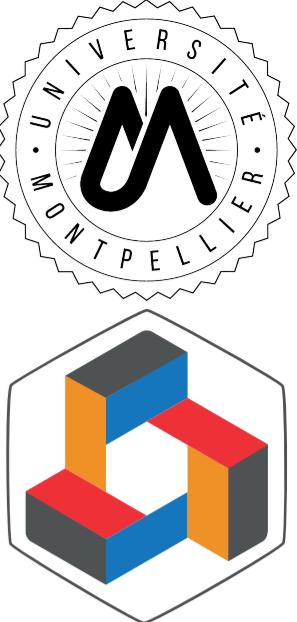


DEVELOPMENT OF A KINECT DRIVER UNDER ROS2

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INTRODUCTION:

Develop a C++ driver using ROS2 for a Kinect camera that will calibrate, then record RGBD images at a requested frequency.



KINECT v2

- Originally designed for XBOX entertainment, the Kinect camera has become a widely used RGBD image acquisition device in robotics.
- Going beyond its initial purpose, it has found a second life in research applications.
- As a cost-effective solution, the Kinect enables robots to track human body movements and engage with them in various applications.

Pros	Cons
RGB-D Imaging	Limited Range
High resolutions sensors	Somewhat outdated (compatibility issues with versioning)
Wide Field of View	Sensitive to sunlight (Not suitable for outdoor applications)
Low-Cost Solution for a complete sensor for image processing	Does not work well when the reaction time is less than seconds Not Ergonomic

ROS1 vs ROS2

3	11	(14)	C++	11	14	17...
python 2			python	2	3	
OS			OS			
<ul style="list-style-type: none"> • Mainly designed for single-process systems. • Better for projects with existing codebases. • For relatively simple robotic applications 						<ul style="list-style-type: none"> • Enhanced real-time support, better strict timing requirements • Designed to be more modular, extensible, and scalable. • has improved support for multi-robot systems

CALIBRATION



IMAGES ACQUISITIONS

Record

- Record environment at a requested frequency for a requested duration.
- Output the images :
 - as a gif.
 - As a requested video format (.mp4, .avi...).
 - As a serie of images.

Calibration :

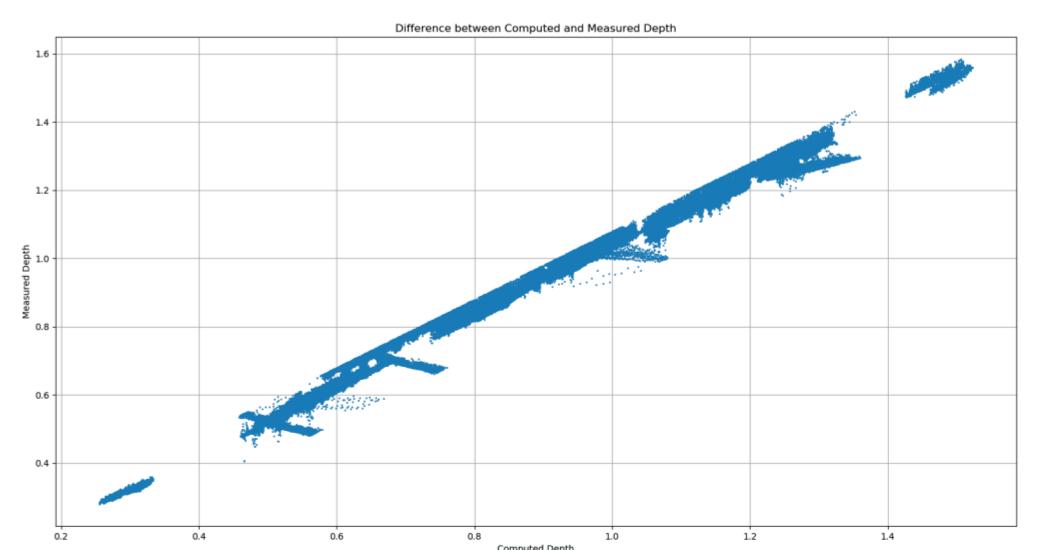
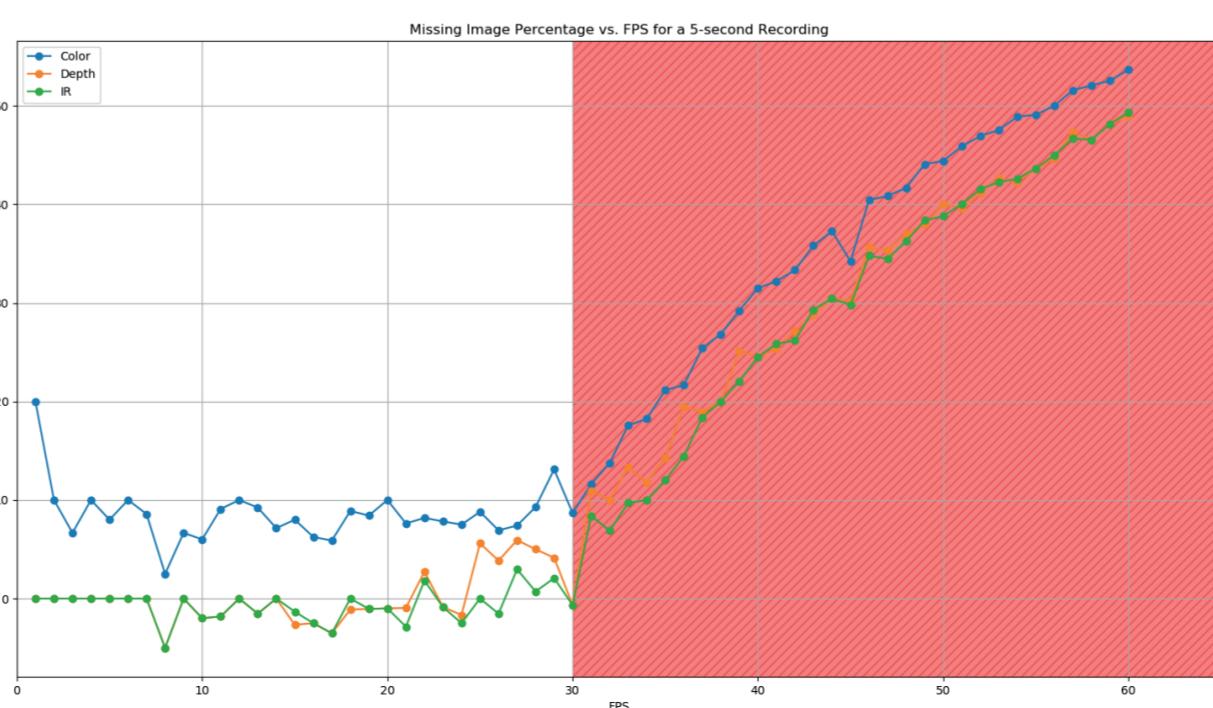
- Output for Color, and IR camera :
 - The camera matrix, corresponding to the intrinsic parameters of the camera.
 - The Distortion Coefficients, corresponding to the models radial and tangential lens distortions.
 - The rotation matrix, which is the rotation of the camera for each calibration image.
 - The projection matrix, the translation of the camera for each calibration image.
- Output the average depthshift.
- Output the pose matrix, used for the stereo camera calibration :
 - Rotation Matrix,
 - Translation Matrix,
 - Essential Matrix, Encodes the relative pose between the two cameras
 - Fundamental Matrix, Relating corresponding points in the left and right images.

Topics :

- /kinect2/hd/image_color_rect → Color Images (classic RGB)
- /kinect2/hd/image_depth_rect → Depth Images (RGB+Depth)
- /kinect2/qhd/image_depth_rect → Infrared Images

RESULT

Performance Test



Result Calibration

