Ideal Video:

Okvis: Open Keyframe-based Visual-Inertial SLAM (ROS Version)

https://github.com/ethz-asl/okvis_ros

Video example: https://www.youtube.com/watch?v=TbKEPA2_-m4&t=4s

According to the GitHub information:

Good results/results at all may one be obtained by appropriate calibration of camera intrinsics, camera extrinsic, knowledge of IMU noise parameters, and accurate time synchronization of all sensors.

To perform a calibration yourself, recommend the following:

- Get Kalibr by following the instructions here https://github.com/ethz-asl/kalibr/wiki/installation.
- If you decide to build from source and you run ROS indigo checkout pull request 3:
    - git fetch origin pull/3/head:request3 git checkout request3
- Follow https://github.com/ethz-asl/kalibr/wiki/multiple-camera-calibration to calibrate intrinsic and extrinsic parameters of the cameras. If you receive an error message that the tool was unable to make an initial guess on focal length, make sure that your recorded dataset contains frames that have the whole calibration target in view.
- Follow https://github.com/ethz-asl/kalibr/wiki/camera-imu-calibration to get estimates for the spatial parameters of the cameras with respect to the IMU.
- Okvis is designed to work with both grayscale and color images for visual odometry and SLAM tasks.

Basalt: Visual-Inertial Mapping with Non-Linear Factor Recovery

https://github.com/VladyslavUsenko/basalt-mirror/blob/master/doc/VioMapping.md

Video: https://www.youtube.com/watch?v=r3CJ2JP75Tc

- To estimate the motion and geometry with a set of images large baselines are required, so most systems operate on keyframes that have large time intervals between each other.
- The common choice in VIO is to preintegrate IMU measurements between consecutive frames.
- Grayscale images can reduce computational complexity and memory requirements while still providing sufficient visual information for mapping.

- The video should have good contrast and texture to facilitate feature tracking and matching.
- If color is used, it should be a consistent color theme.

Calibration of implemented camera models:

- Many large field-of-view cameras are used.
    - Fisheye lenses
    - https://ieeexplore.ieee.org/document/8491007
    - The paper above discusses different recommended cameras

ROVIO (Robust Visual Inertial Odometry):

https://github.com/ethz-asl/rovio

Video: https://youtu.be/ZMAISVy-6ao

- Color: Grayscale videos may be useful in many different types of research, but if color information is beneficial, colors should be chosen that enhance feature detection and tracking.
- The cfg/rovio.info provides most parameters for rovio. The camera extrinsics qCM (quaternion from IMU to camera frame, Hamilton-convention) and MrMC (Translation between IMU and Camera expressed in the IMU frame) should also be set there. They are being estimated during runtime so only a rough guess should be sufficient.
- The paper does not exactly say if IMU calibration is necessary however it is useful for accurate sensor measurements.
- The rovio_node.launch file loads parameters such that ROVIO runs properly on the Euroc datasets. The datasets are available under: http://projects.asl.ethz.ch/datasets/doku.php?id=kmavvisualinertialdatasets -- from github

OpenVINS:

Documentation: https://docs.openvins.com/

Github: https://github.com/rpng/open_vins

Getting started guide: https://docs.openvins.com/getting-started.html

- Calibrate IMU and Camera is critical
- Greyscale is preferred in examples and papers with OpenVins, primarily used in greyscale.
- Lens distortion may appear so pre-processing steps may be required.
- Typical image format like jpeg.
- Video: https://www.youtube.com/watch?v=KCX51GvYGss

VINS-Fusion:

- Github: https://github.com/HKUST-Aerial-Robotics/VINS-Fusion
- Stereo Cameras
- You can run VINS-Fusion with three sensor types (monocular camera + IMU, stereo cameras + IMU and stereo cameras).
- This https://github.com/hengli/camodocal is for camera calibration.
- Both greyscale and color can be used however, grey scale is preferred due to the lower computational requirements, and it still provides enough information.
- Camera and IMU synch are important and required.
- Typically requires IMU calibration at the beginning for accurate measurements.
- Example of camera calibration examples: https://github.com/HKUST-Aerial-Robotics/VINS-Fusion/tree/master/camera_models/camera_calib_example

ORB-SLAM3: An Accurate Open-Source Library for Visual, Visual-Inertial and Multi-Map SLAM

- Github: https://github.com/UZ-SLAMLab/ORB_SLAM3
- Cameras: monocular, stereo and RGB-D cameras, using pin-hole and fisheye lens models
- Color: ORB-SLAM3 can use both greyscale and color videos/images.
- (Cool little tid bit of information that if the visualization is poor or gets lost it starts a new map that will merge with the old map)
- Need to initialize the IMU and calibration before initializing, so you must calibrate the IMU in the beginning.

Kimera-VIO:

- Github: https://github.com/MIT-SPARK/Kimera-VIO
- The library goes beyond existing visual and visual-inertial SLAM libraries (e.g., ORB-SLAM, VINS- Mono, OKVIS, ROVIO) by enabling mesh reconstruction and semantic labeling in 3D.
- Input in the form of camera images and IMU data.
- Both greyscale and color can be used.
- KIMERA uses sensor fusion techniques to combine IMU measurements with visual data to estimate the motion trajectory of the camera more accurately. KIMERA may use IMU data to help initializing of the camera's pose.