Hi, everyone, I am Mengyang Li. Now, let me introduce the DM-VIO system. As delving deeper into the DM-VIO system, we encounter its core innovation: Delayed Marginalization. This technique Overcomes limitations of traditional marginalization by allowing relinearization and integration of IMU information post-initialization.

It elegantly sidesteps the irreversible nature of traditional marginalization, allowing for subsequent updates with inertial measurements. The result? It can now adjust our linearization points dynamically, preserving the system's accuracy.

This leads us to the Pose Graph Bundle Adjustment, or PGBA, which is a strategic optimization process. By infusing the delayed graph with IMU factors, it achieves a more refined initialization, one that's both rapid and precise. It is not just adjusting poses here; It is capturing the complete photometric probability distribution, a task that's handled efficiently through the GTSAM library using the optimizer.

In essence, PGBA is a hybrid, a middle ground that outperforms full Bundle Adjustment in speed while maintaining a higher degree of accuracy compared to standard Pose Graph Optimization. This balanced approach is vital, particularly for autonomous systems

where computational resources are at a premium.

This multi-stage IMU initialization strategy underscores this balance. It begins with a coarse adjustment of the unknowns — think scale, gravity direction, biases — while fixing the rest. This sets the stage for the PGBA, which then takes these initial estimates and refines them, integrating the full visual covariances. And it's the delayed marginalization that empowers both the PGBA and the ability to replace the marginalization prior as new data streams in.

Through these methods, DM-VIO not only pushes the envelope in visual-inertial odometry but does so in a way that's both computationally elegant and robust."

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In greater detail, this system's photometric bundle adjustment has been optimized for dynamic weight adjustment, which is key to maintaining stability amidst variable feature quality. The IMU initialization algorithm is particularly innovative, offering rapid and accurate state initialization from IMU data alone, circumventing the need for initial position or velocity inputs.

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In the experimental evaluation, observed compelling results across various datasets. On the EuRoC dataset, DM-VIO showcased a significant edge over existing methods. This includes not just monocular systems but also stereo-inertial systems, which traditionally have had an upper hand in such evaluations.

Turning to the TUM-VI dataset, known for its challenging sequences, the system again outperformed state-of-the-art methods. This was not a small feat; it highlights the efficacy of DM-VIO's robust initialization and optimization techniques.

Perhaps most notably, on the 4Seasons dataset—a relatively new addition featuring time-synchronized visual-inertial sensors—the DM-VIO system was pitted against stretches of constant velocity. Such conditions are typically challenging for monocular methods due to the difficulty in scale estimation. However, with our novel IMU initializer leveraging delayed marginalization and Pose Graph Bundle Adjustment, DM-VIO not only coped but excelled, even outperforming stereo-inertial methods like ORB-SLAM3 and Basalt. And it did so using a monocular setup without the aid of loop closures, which is often used to enhance the accuracy of SLAM systems.

These results are not just numbers; they represent a significant step forward in monocular visual-inertial odometry. The success of DM-VIO across diverse scenarios — from drones to handheld to automotive — signals a move towards more versatile and robust monocular methods, potentially expanding the scope of where and how VIO systems can be deployed.

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In conclusion, DM-VIO represents a substantial advancement in visual-inertial odometry. This system not only enhances the performance of monocular VIO but also sets the stage for future research directions. We are excited about the potential applications of this system and look forward to further improvements and implementations.

Now, let's welcome Honglin Wu to introduce next part.