A 2.5D APPROACH TO 360 PANORAMA VIDEO STABILIZATION

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Abstract

This paper presents a method for stabilizing both cylindrical and spherical panorama videos with a 360-degree field of view. Our method decouples the rotation from other motions and applies different strategies for smoothing them. The proposed approach is 2.5D as it estimates 3D rotations without involving 3D structure-from-motion methods. It is more robust and can be performed in an incremental way.
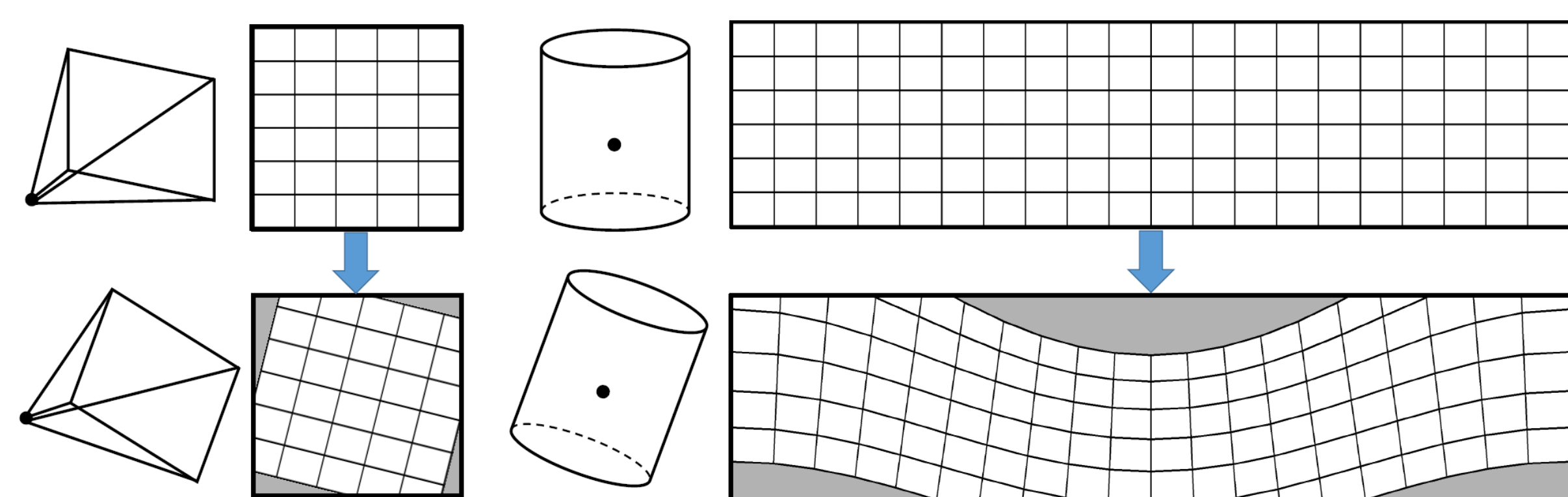
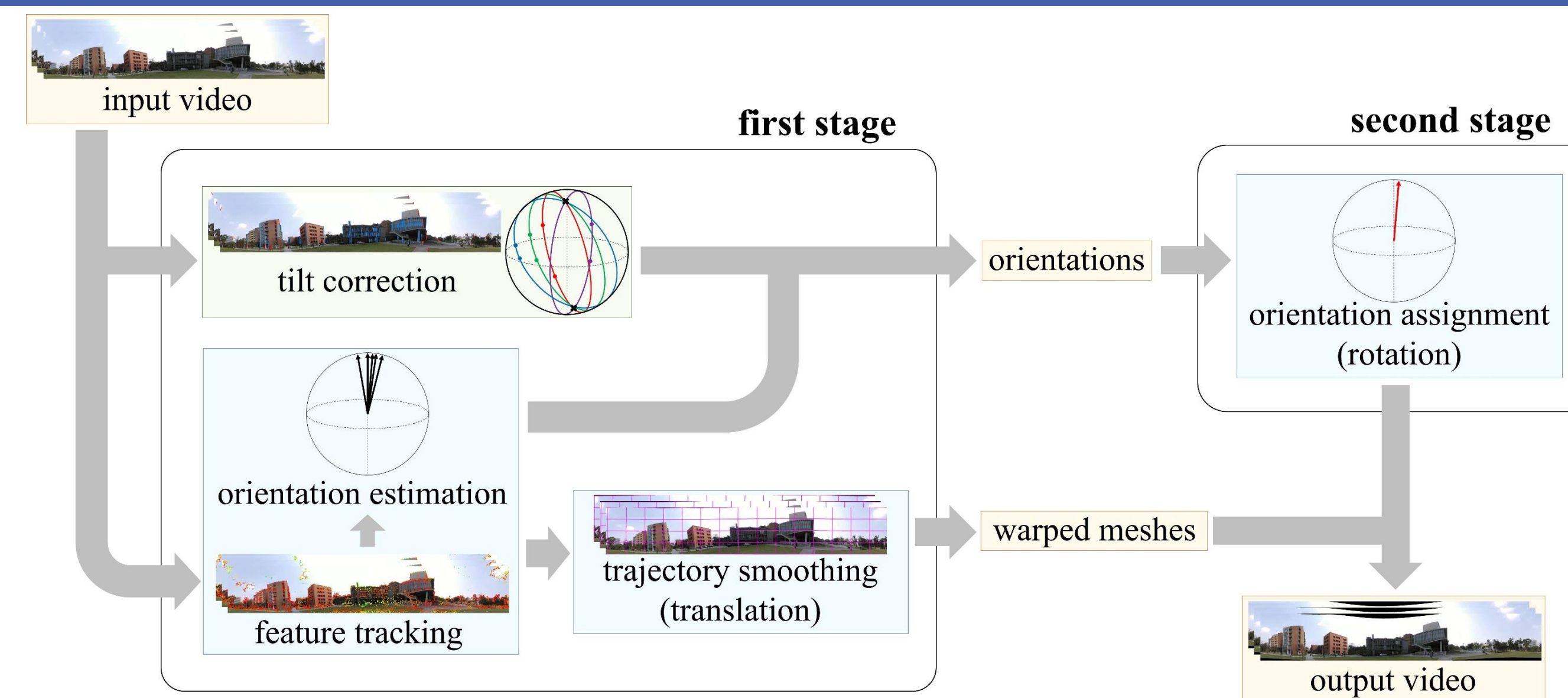## Introduction

A conventional method
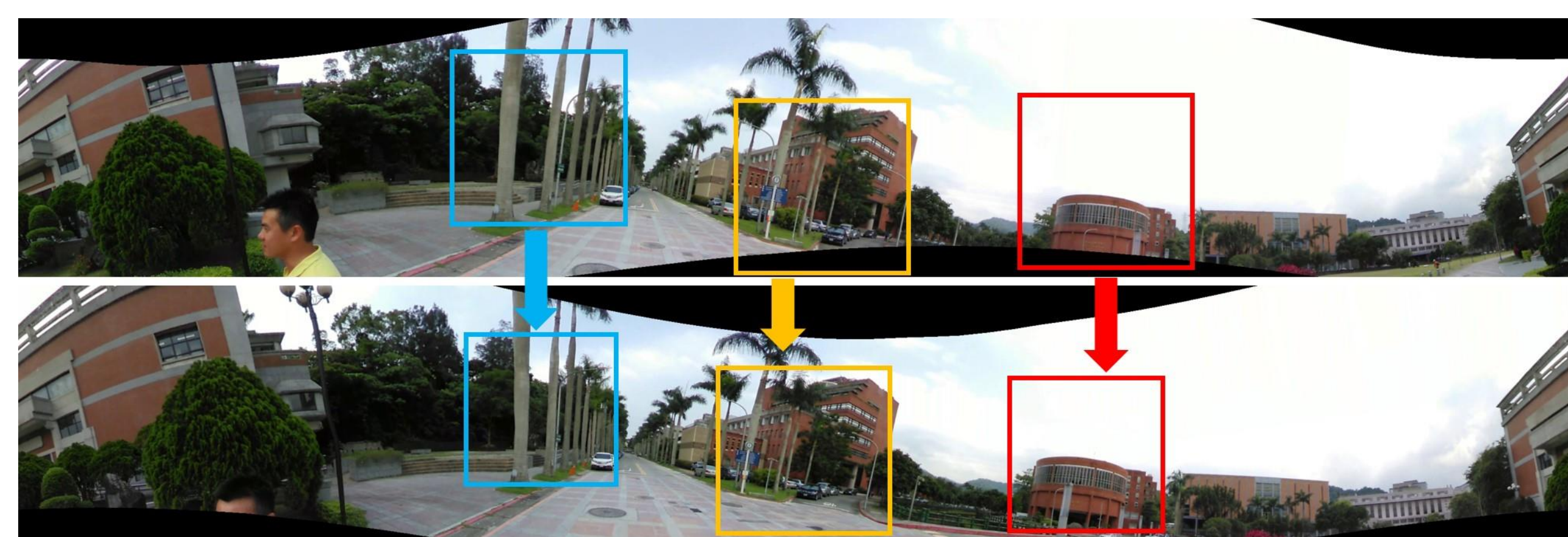
The proposed method

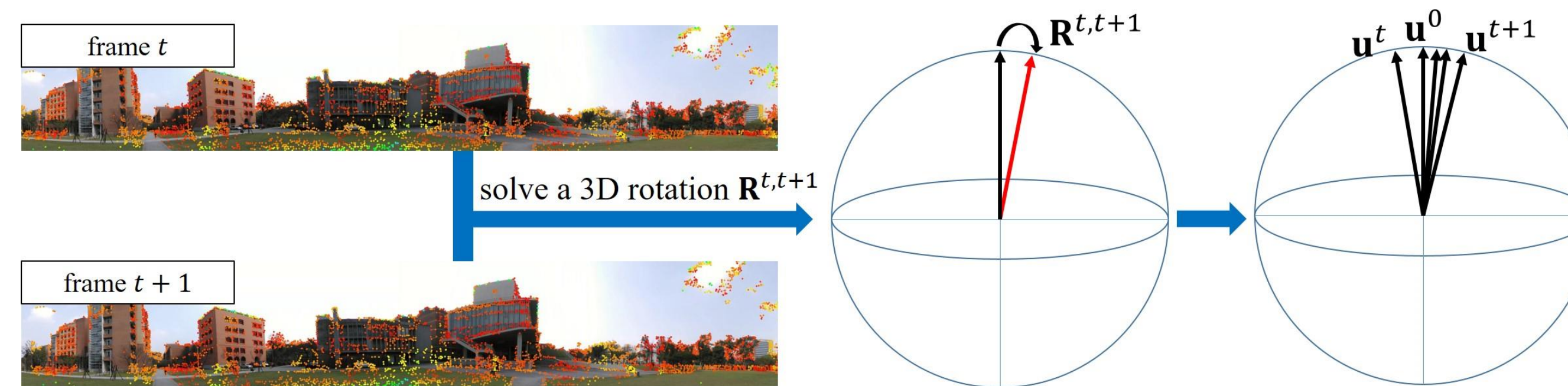The proposed method with tilt correction

(a)   (b)

The influence of camera rotation

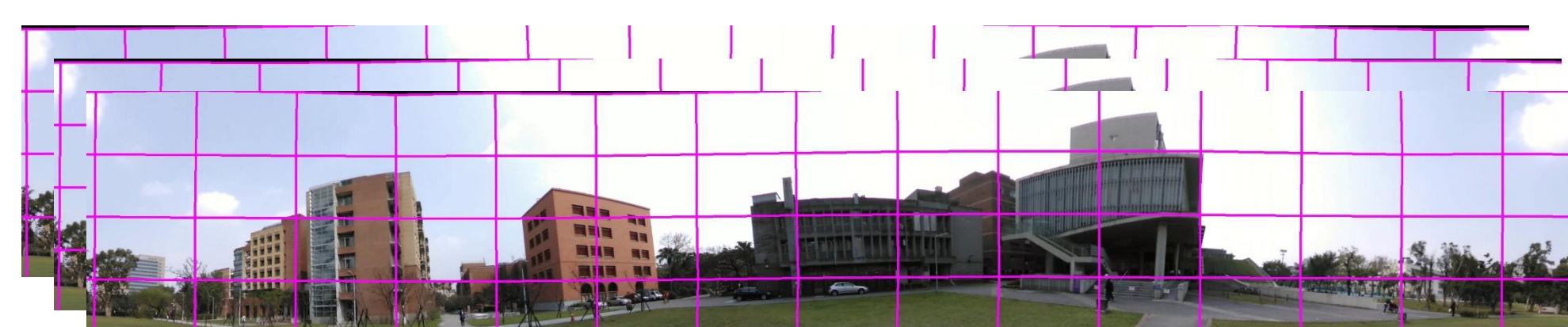## Overview of the proposed method

input video

first stage   second stage

tilt correction   orientations   orientation assignment (rotation)

orientation estimation   trajectory smoothing (translation)   warped meshes

feature tracking   output video

Orientation estimation

frame t

frame $t+1$

solve a 3D rotation $\mathbf{R}^{t,t+1}$

$\mathbf{R}^{t,t+1}$ $\mathbf{u}^t \ \mathbf{u}^0 \ \mathbf{u}^{t+1}$

Trajectory smoothing

$$\mathbf{E}(\mathbf{V}) = \mathbf{E}_d(\mathbf{V}) + \lambda \mathbf{E}_s(\mathbf{V})$$

Title correction

Camera models

W

p

H

y

x

$r=1$

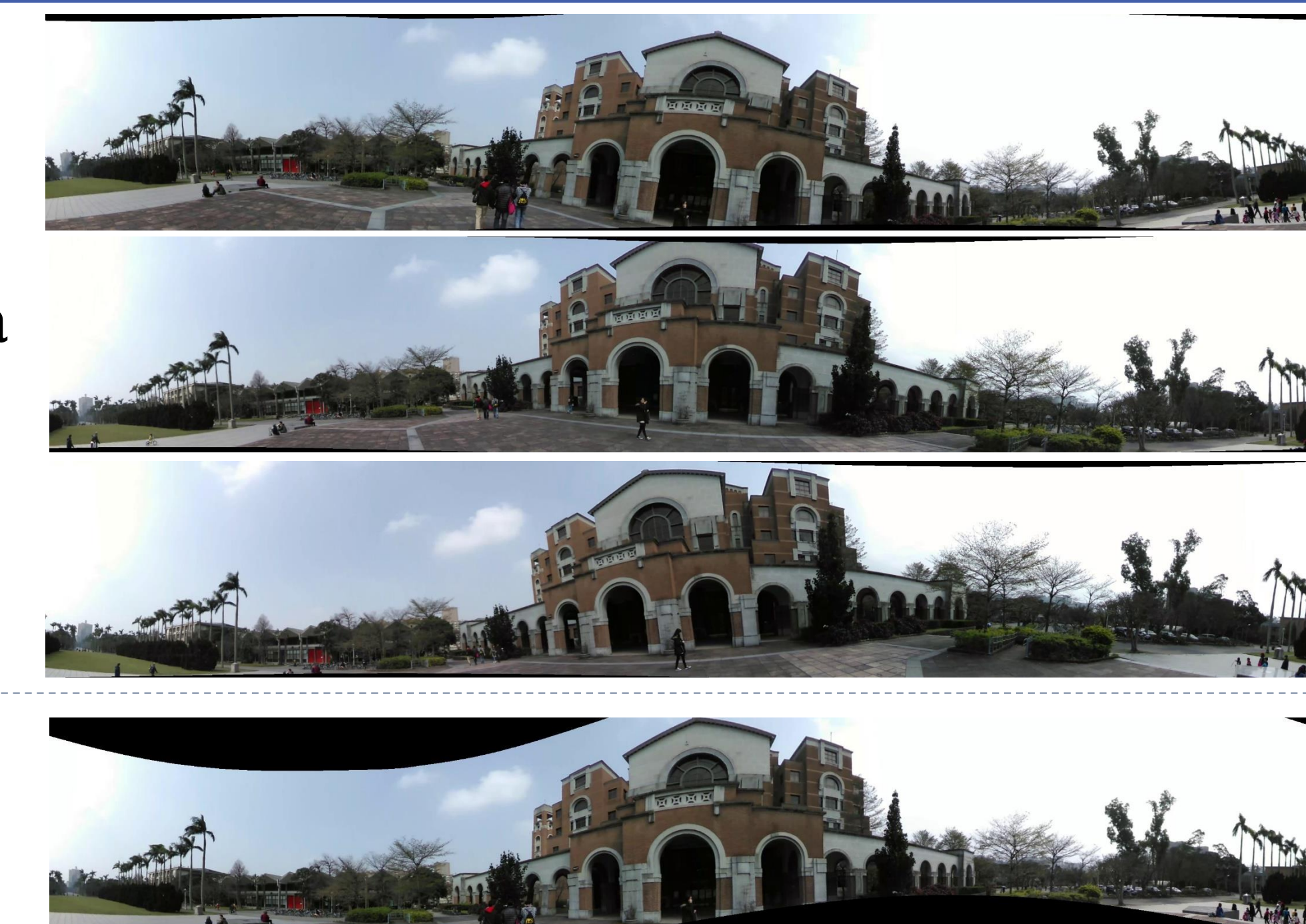y z h_u

O x $\phi(p)$

h_d

$\phi(p)$
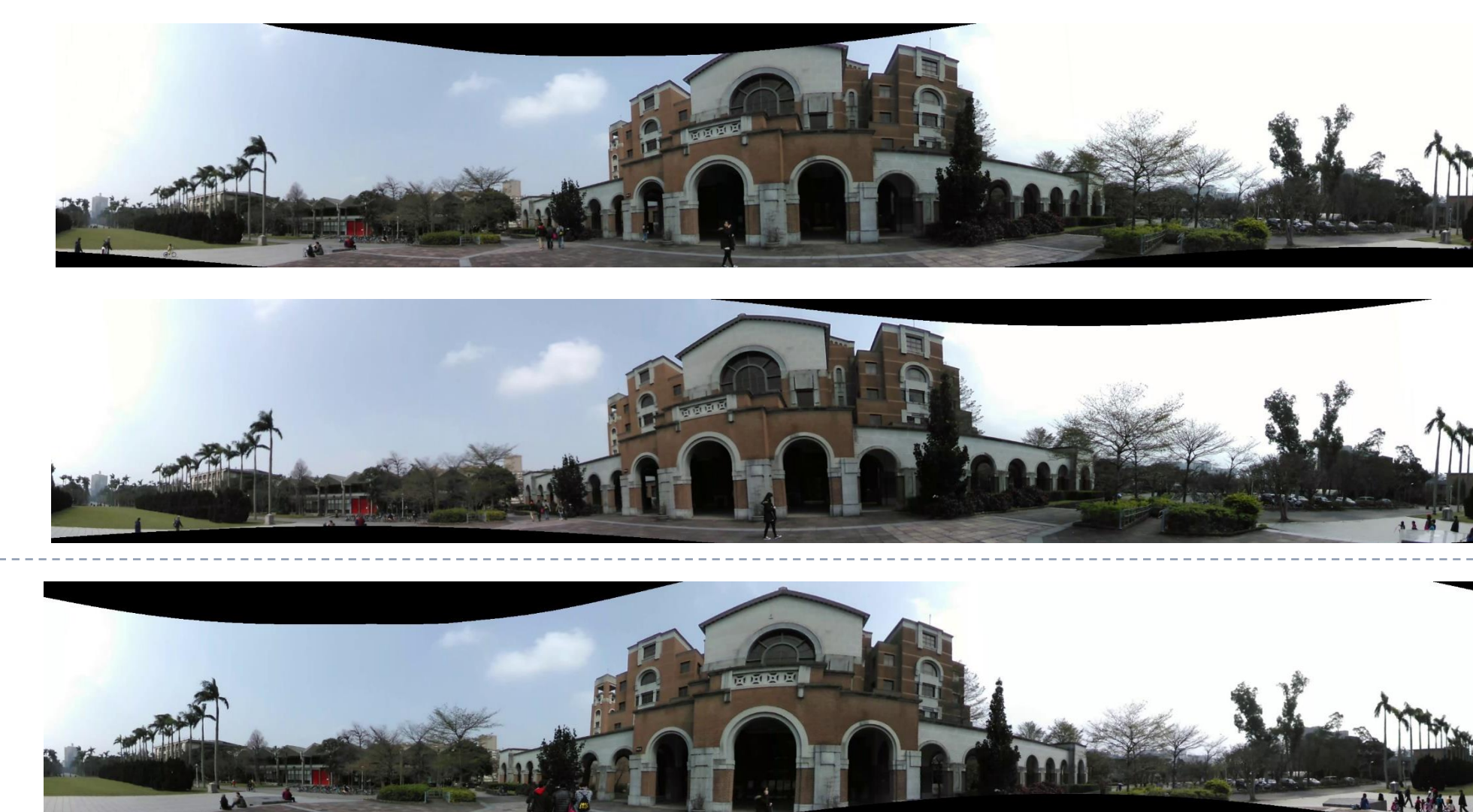
y

O x z
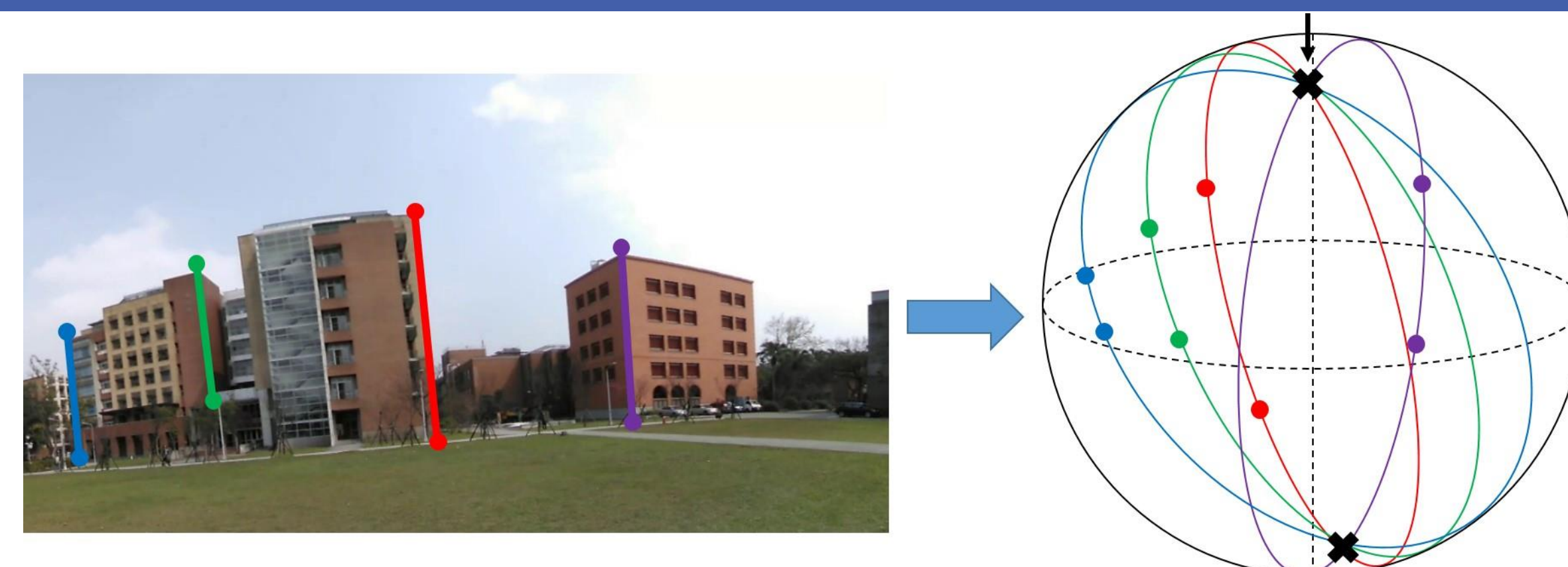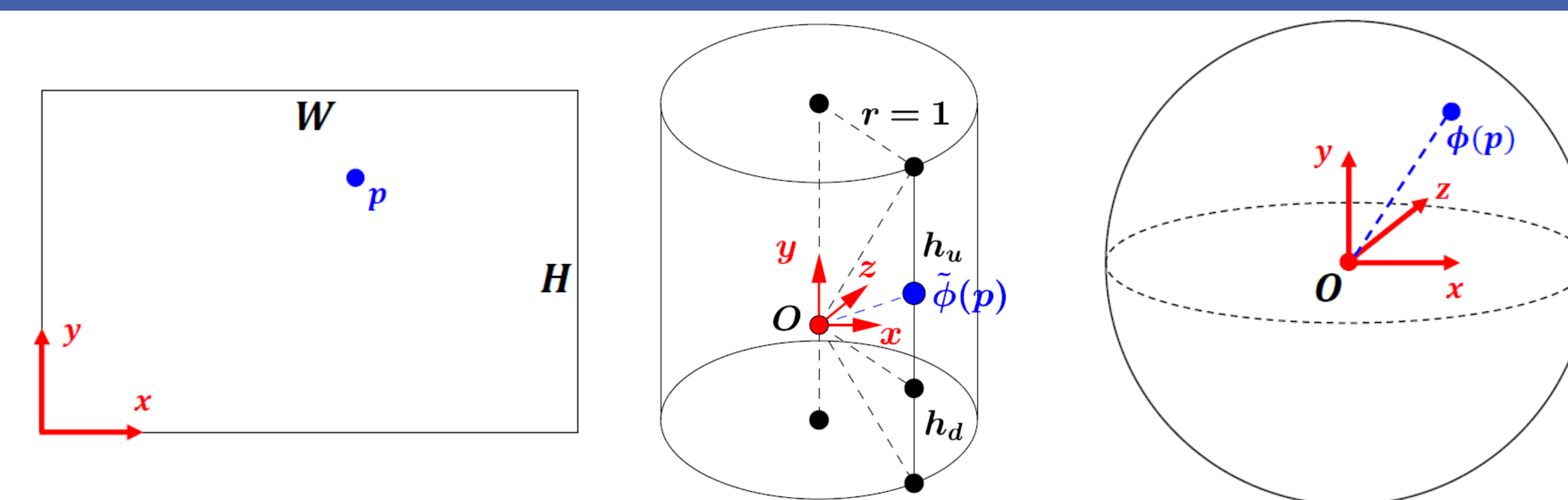
Results

Bundle camera path

The proposed method

With tile correction

Results for cylindrical videos.

Original video

Our results

With tilt correction

Results for spherical videos.