In model 2, we need two completely same sun-tracking cameras and they have been set up to be synced.

1 Preparation phase: calculate conversion relationship between actual distance and pixel in the photo.

Put two sun-tracking cameras along the side of the solar farm. Record the position of them as . We can assume all the sunlight is parallel. Therefore the direction vector of both cameras can be recorded as .

Take consecutive frames using the two cameras at the same time. In a couple of photos which are taken at the same time, sun is at the center of the photos but the cloud blocks are at different position. Choose a cloud block in one photo which is in the same row as the sun; use it as a test block. Find out the test block in the other photo; calculate the difference in pixel in the couple of photos between the center of the test block and sun, record the pixel difference as p.

Besides, the dihedral angle γ between the plane of the photo and the ground is ,

,(在底面且垂直于交线的向量)

= (b, -a, 0),(在底面且平行于交线的向量)

,

Therefore, in the cloud plane, the distance between two cameras should be

Therefore, the ratio ρ of the true distance in the sky to the pixels in the photo is that ρ=, the unit is meter per pixel.

2 Calculate the motion vectors in two consecutive photos

3 Mapping motion vectors in the solar farms

Record each solar cells’ position coordinate. Set up a spatial coordinates as the picture below.

∀point on the ground can be described as C1P⊥C1C2, C1Q C1C2

;

In each mixed photo, set up a coordinate with origin of the center of camera 1, x-axis||p, and y-axis⊥p, and find the motion vector with.

