The ‘probability’ of having the classical isotropic universe is estimated using a new formulation derived by the path integral method of loop quantum cosmology. We construct the solution space of this model by using a new formulation which is preferable to study the Bianchi type I model. Therefore effective equations of motion are used to study the dynamics. We derived the equations by using path integral method and construct a new formulation which is preferable to study the Bianchi type I model.

### Behavior of solutions in LQC
As well as the isotropic model, the initial singularity is replaced with the initial bounce in our anisotropic model. Some solutions have very low anisotropy like our observed universe. However, on the other hand, some solutions have very large anisotropy. Therefore we should construct the set of all solutions to estimate the ‘probability’ to have the classical isotropic universes.

The solution with low anisotropy (case A)

The solution with large anisotropy (case B)

### Solution space Analysis
We regard the set of all initial data at the bounce as the solution space. The solution space of our model is a two-dimensional space. We found the surprising fact that except the hexagon area at the center, the universe shows cyclic behavior and never becomes sufficiently classical!

The solution space of our model.

### The ‘probability’ estimation
We define the ‘probability’ as the normalized area in the solution space where the desired condition is satisfied. We estimate the ‘probability’ for the anisotropic parameter M. The result shows that the isotropic universes are disfavored in LQC. However, if we consider more realistic model, LQC can explain the present isotropy by giving the ‘actual’ upper limit for M.

The contours denote, from inside, \( M = 0.1, 0.5, 1.0, 1.5 \).

Note that most of region satisfies \( M = 0.1 \).

This is the ‘actual’ upper limit of M.

The probability for having M<2

We cannot expect the appearance of the isotropic universes.

### Summary
- We constructed a new formulation of Bianchi type I spacetime in LQC. The formulation extracts the physical degree of freedom. Therefore we can easily construct the set of all physically distinct solutions.

- As well as the isotropic model, the initial singularity problem is resolved by replaced with the initial bounce. Although the anisotropy is preserved, the universe is not symmetry across the bounce.

- In addition to the universes which evolve into the classical universes, we found the cyclic and the stationary solutions which are dominated by the quantum effect.

- The ‘probability’ for having the isotropic universes are estimated. Although the result is negative, if we consider more realistic stuation, LQC can explain the present isotropy by giving the ‘actual’ upper limit.