* 1. Let define the following two state MDP with zero rewards-

Choosing the linear subspace - , for some :

As requested,

* 1. The features in this case-
  2. The Bellman operator in this case-

The transition probabilities-

And-

* 1. The stationary distribution upholds-

We get-

* 1. The projection of into subspace is of form - where -

And upholds -

The Weighted Euclidean Norm for is -

Where -

We get-

After derivation and equaling to zero we get-

The projection operator -

After calculating with MATLAB -

* 1. The Bellman Operator applied on -

Projecting the result to gives us-

* 1. After 1st iteration -

After 2nd iteration -

Proceeding to the nth iteration (n being even)-

For-

diverges as