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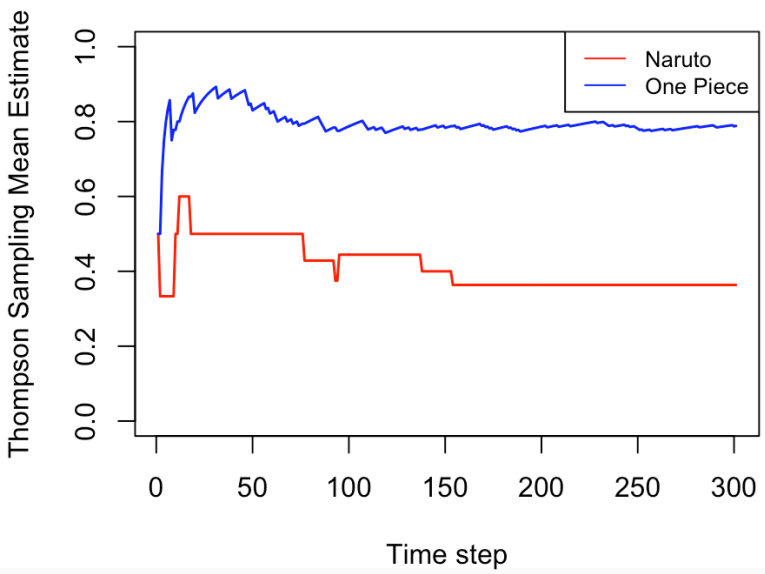
15.780 HW5

**1)**
Naruto: mean = **0.6**
One Piece: mean = **0.79**

```
# 1) compute means of each show
mean_nar = mean(anime$NarutoShippuden)
mean_nar
mean_one = mean(anime$OnePiece)
mean_one
```

```
> mean_nar = mean(anime$NarutoShippuden)
> mean_nar
[1] 0.5966667
> mean_one = mean(anime$OnePiece)
> mean_one
[1] 0.7866667
```

**2)**
(code for Thompson Sampling and bandit algorithm taking directly form rec10)




```
# 2) estimate means with Thompson Sampling
set.seed(15)
number_arms = ncol(anime)
# Set number of periods
horizon = 300
```

```
mab_thm = bandit_algo('thompson_sampling')

#' Plot the mean reward estimates at each step for Thompson
plot(1, type='n', xlim = c(1,horizon+1), ylim=c(0,1),
     xlab = 'Time step', ylab = 'Thompson Sampling Mean Estimate')
lines(mab_thm$arm_means[1,], type='l',lwd=1.5, col='red')
lines(mab_thm$arm_means[2,], type='l',lwd=1.5, col='blue')
legend("topright", lty=c(1,1,1,1), cex=0.8,
       legend=c("Naruto", "One Piece"),
       col=c("red", "blue"))
```

**3)**


```
# 3) Plot show watched vs time step
plot(mab_thm$pulled_arm, xlab = 'Time step', ylab = 'Arm chosen', main='Arm chosen by Thompson')
```

**4)**

Naruto: **0.41**
One Piece: **0.8**

The estimated mean for One Piece was very close to its actual mean of 0.8. However, the estimated mean for Naruto was not very close to its actual mean of 0.6. This may be because the mean for One Piece is higher enough than that of Naruto (such that One Piece's distribution lies almost entirely above that of Naruto after a few samples) that the algorithm figured out early on that it is the better show, so it became increasingly unlikely for the algorithm to pick a value from the Naruto distribution that was higher than the value from the One Piece distribution. This means that the algorithm ends up picking One Piece almost every time, getting a very accurate estimate of its actual mean, while it rarely picks Naruto and thus is unable to accurately estimate its mean.

**5)**

Naruto was watched 9 times out of 300 = **3/100**.

```
> sum(mab_thm$pulled_arm == 1)
[1] 9
```