Lab 7 : Modelling strategic conflict between nations

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In this lab, we used Richardson's mathematical model of conflict to analyse strategic conflict between two nations. We analysed four cases : Mutual disarmament without grievance , Mutual disarmament with grievance , Unilateral disarmament and Arm race.

I. MODEL

Strategic conflict between two nations is captured by the following coupled equation.

$$\dot{x} = ky + g - \alpha x \tag{1}$$

$$\dot{y} = lx + h - \beta y \tag{2}$$

II. RESULTS

A. Mutual disarmament without grievance

The parameters value are as following. $k = 3, l = 5, h = 0, g = 0, \alpha = 9, \beta = 7, x_0 = 5, y_0 = 5, \Delta t = 0.001$.

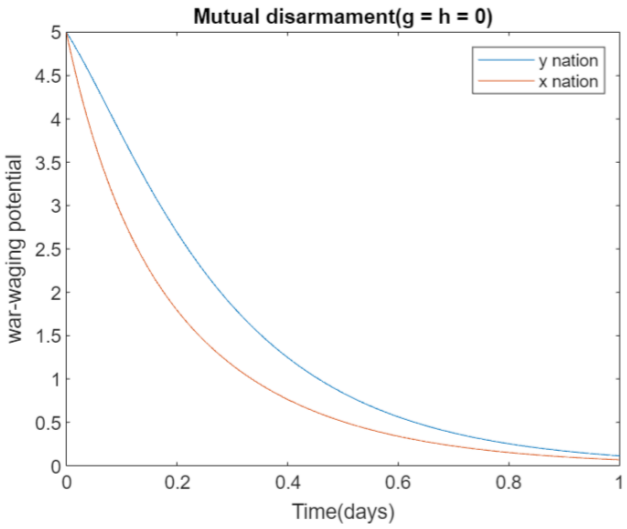

FIG. 1. plot of x *vs* t and y *vs* t with normal scaling

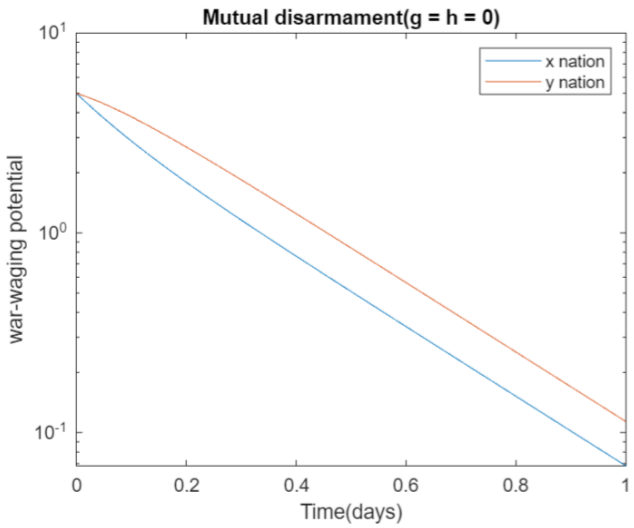

FIG. 2. plot of x *vs* t and y *vs* t with logarithmic scaling

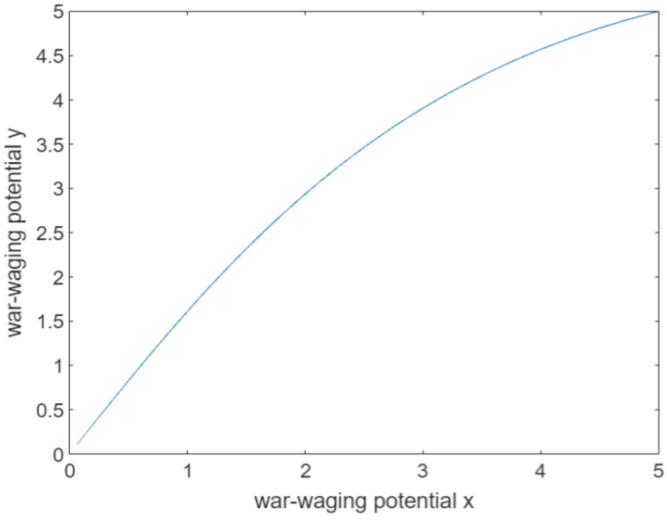

FIG. 3. plot of y *vs* x

B. Mutual disarmament with grievance

The parameters value are as following. $k = 3, l = 5, h = 3, g = 2, \alpha = 9, \beta = 7, x_0 = 0, y_0 = 0, \Delta t = 0.001$.

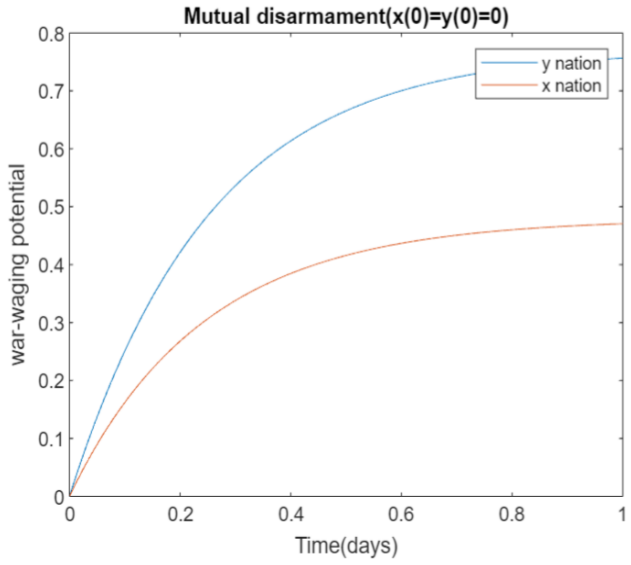

FIG. 4. Plot of $x(t)$ *vs* t and $y(t)$ *vs* t

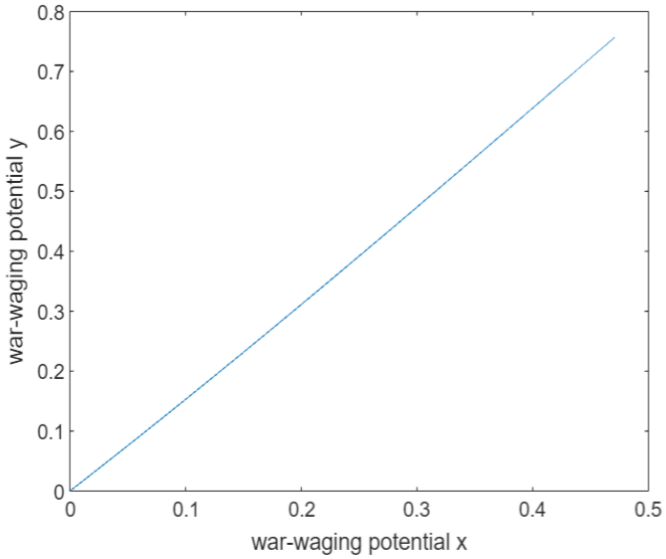

FIG. 5. plot of y *vs* x

C. Unilateral disarmament

$k = 3, l = 5, h = 3, g = 2, \alpha = 9, \beta = 7, x_0 = 5, y_0 = 0, \Delta t = 0.001$.

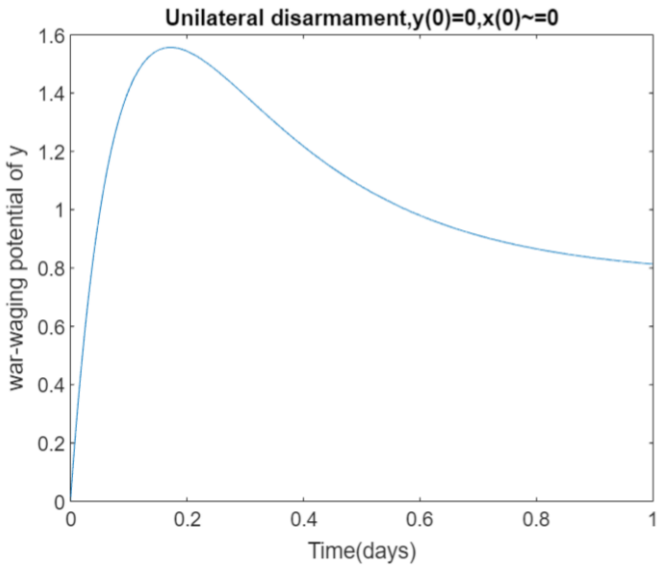

FIG. 6. Plot of y *vs* t

D. Arm race

$k = 3, l = 5, h = 0, g = 0, \alpha = 0, \beta = 0, x_0 = 2, y_0 = 3, \Delta t = 0.001$.

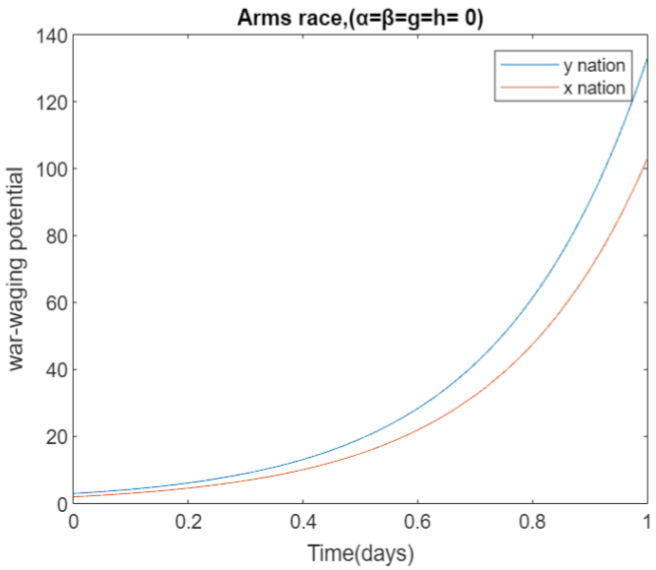

FIG. 7. plot of x *vs* t and y *vs* t with normal scaling

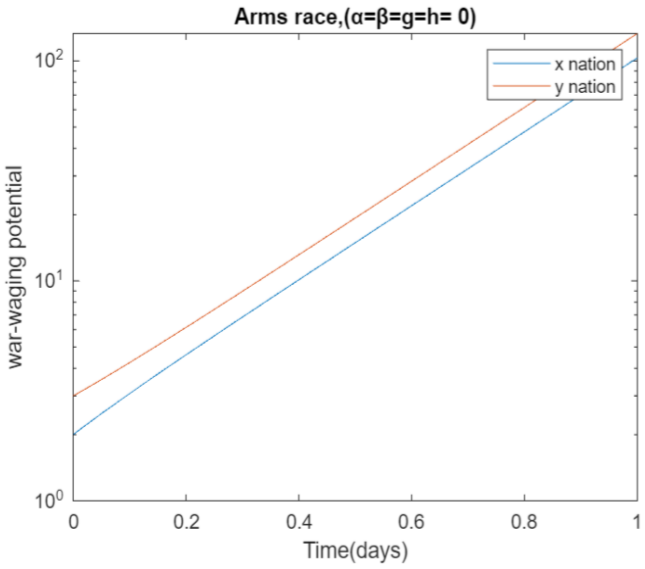

FIG. 8. plot of x vs t and y vs t with logarithmic scaling

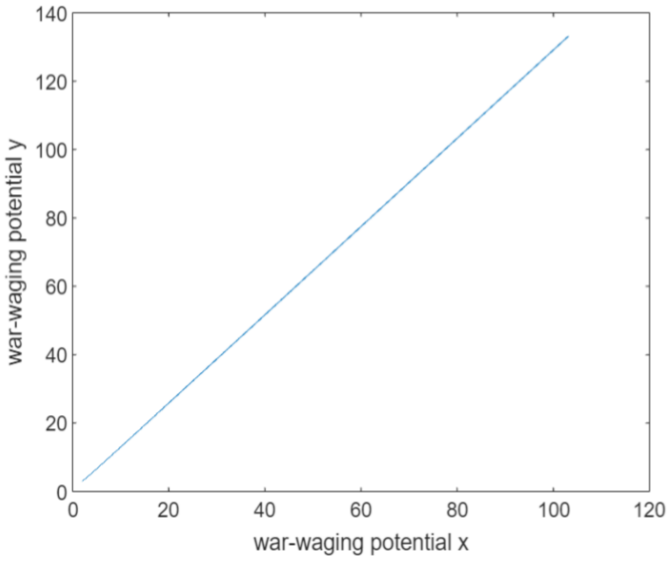

FIG. 9. Plot of y vs x

E. Conclusion

- In the case of Mutual disarmament without grievance the war potential decrease as time passes but increase in case when countries have grievances against each other.
- In case of arms race the war potential of both the countries increases as the time passes.
- In case of the Unilateral disarmament the war potential of y increases to an extent and then decrease and becomes constant.