Being a Life Winner within 1000 Days

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Introduction

For most normal people, being a life winner will be a reachless dream. This project will be helpful and give some advice for being a life winner with more happiness.

Optimal Control Problem Formulation

1. General Ideal

Life has many many components, to simplify the problem, some factors can be ignored. In this formulation, one's life have five components as strength, money, charm, health, experience and happiness.Then doing some activities will have an affect on these status, so the differentialstates are strength, money, charm, health and experience while the controls are rest, work, fitness and study.The object is happiness and the goal of the program is to maximize the sum of it.

Setting the t_start and t_end as 0 and 10 respectively, the step size is 0.01 so the whole duration will be 1000 days.

2. Relationship Setting

a.　Strength

Strength is the energy that one can consume to do other things.

In the formulation, one's strength is related to how long he take the break, the longer the rest is, the more strength will be recovered. And of course working, going fitness and studying will decrease the strength.Besides these activities, the status "health" will also effect the recover and consumption of strength, as the health is high, the speed of recover will be enhanced and the consumption will be lower.

b.Money

Money is a key point in most people's lives, without money one can not do anything except sleep.

In the formulation, working is the only way to earn money and there are some activities that consumes money. When earning money, it is related to his working time and experience. When the working time is longer, more money will be earned. And of course more experience will help to earn more. In consumption, going fitness and studying will cost money and daily expense is also taken into account.

As the quantity of assets will make one happy, it will also be a part of happiness.

c. Health

Health is the most important part of human's life.

In the formulation, health is one of the multi-functional parameter in the five. It will be effected by the time one's going fitness, working time and studying time.As in common sense, doing exercise will helpful to physique, and longtime working and studying is unhealthy. Health can also effect other parameters, as mentioned above, if the value of health is higher, less strength will be consumed when doing some activities.

In common sense, health is the most thing in one's life, whether one is healthy will be an important part of one's happiness, so it is taken in quadratic form when calculating happiness.

d. Charm

Charm is kind of abstract and it can be expanded as knowledge, confidence and charm itself.

In the formulation, charm will increase when going fitness or studying. And if don't do anything, it will decrease as one don't do anything.

When charm is interpreted as knowledge or confidence, it will bring happiness to one's life.
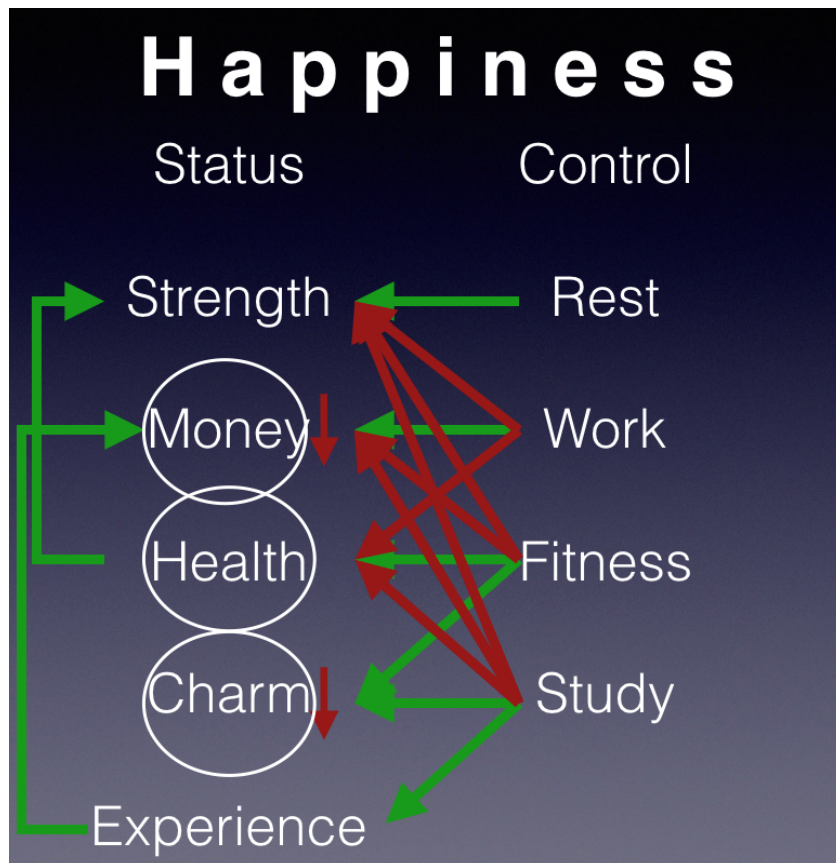
e. Experience

Experience denotes the level of work that one can take.

In the formulation, experience will only effected by the study time, as more study will make the work be more efficient.

f. Happiness

Happiness is the key factor of one's life. It is important to live a happier life.

In the formulation, happiness is related to one's money, health and charm. But in real life, people's mood will be effected by some accidental things, so a random function is added into it to assure its veracity.

3. Initial Value and Final Value Setting

a. Initial Value

As a diaos, the initial value of strength, money, health, charm and experience are 1, 1.2, 1, 0, 1 respectively.He does have a lot of potential to explore and after execute the plan he would be a superman.

```
(AT_START,strength      == 1  );
(AT_START,money         == 1.2);
(AT_START,health        == 1  );
(AT_START,charm         == 0  );
(AT_START,experience    == 1  );
```

b. Final Value

As a hunk, he should be rich, healthy, strong, knowledgeable and charming, so in the end the value of money need to greater than 2.5, the health should be greater than 2.2 and the charm need to greater than 1.5.

```
(AT_END,health          >= 2.2);
(AT_END,charm           >= 1.5);
(AT_END,money           >= 2.5);
```

4. Limitation Setting

a. Status Limitation

i. Strength

To assure one's life, the strength should be always greater than 0.2, or he will goes die. And the upper bound is 1.2, at this value, more rest won't enhance the strength any more.

ii. Money

In real life, most people will not spend all of their assets, so in the formulation, the value of money need to greater than 0.2.

iii. Charm

Since charm is a mixture of some factors. Personally I set it between 0 and 3.

iv. Health

Just like strength, the value of health need to greater than a lower bound which is set as 1, and the upper bound is 2.5.

```
(0.2 <= strength <=1.2 );
(0.5 <= money          );
(0   <= charm    <=  3 );
(1   <= health   <= 2.5);
```

b. Control Limitation
i. Rest

Normal people need to take break everyday, so the lower bound of a day is 0.3, which means one need to take rest at least if 7.2 hours each day.(0.3×24=7.2)

ii. Work,Fitness and Study

Each of these items are between 0 and 1 which need to make sense.

iii. General

Time in one day is add up to 1, so the sum of all the four activities need to between 0 and 1.

```
(0.3 <=            rest                    <= 1);
( 0  <=            work                    <= 1);
( 0  <=            fitness                 <= 1);
( 0  <=            study                   <= 1);
( 0  <= rest + work + fitness +study <= 1);
```

Result

The final value of happiness is 2.07e+02 as showing below.

```
sqp it | qp its |      kkt tol |      obj val |    merit val |      ls param |
     1 |    210 | 3.768307e+02 | -1.762681e+02 | -8.072780e+01 | 1.000000e+00 |
     2 |    184 | 2.960091e+01 | -2.049004e+02 | -2.037380e+02 | 1.000000e+00 |
     3 |    178 | 2.274387e+00 | -2.065083e+02 | -2.057086e+02 | 1.000000e+00 |
     4 |    173 | 3.964776e-01 | -2.067565e+02 | -2.065786e+02 | 1.000000e+00 |
     5 |    166 | 1.577016e-01 | -2.068702e+02 | -2.068173e+02 | 1.000000e+00 |
     6 |    165 | 4.691963e-02 | -2.068973e+02 | -2.068735e+02 | 1.000000e+00 |
     7 |    167 | 5.391684e-03 | -2.068927e+02 | -2.068917e+02 | 1.000000e+00 |
     8 |    167 | 2.266640e-04 | -2.068925e+02 | -2.068924e+02 | 1.000000e+00 |
     9 |    168 | 1.183950e-05 | -2.068925e+02 | -2.068925e+02 | 1.000000e+00 |
sqp it | qp its |      kkt tol |      obj val |    merit val |      ls param |
    10 |    168 | 1.108321e-06 | -2.068925e+02 | -2.068925e+02 | 1.000000e+00 |
    11 |    168 | 2.747753e-10 | -2.068925e+02 | -2.068925e+02 | 1.000000e+00 |

Covergence achieved. Demanded KKT tolerance is 5.000000e-10.
```

The sequence of being a hunk is showing below.
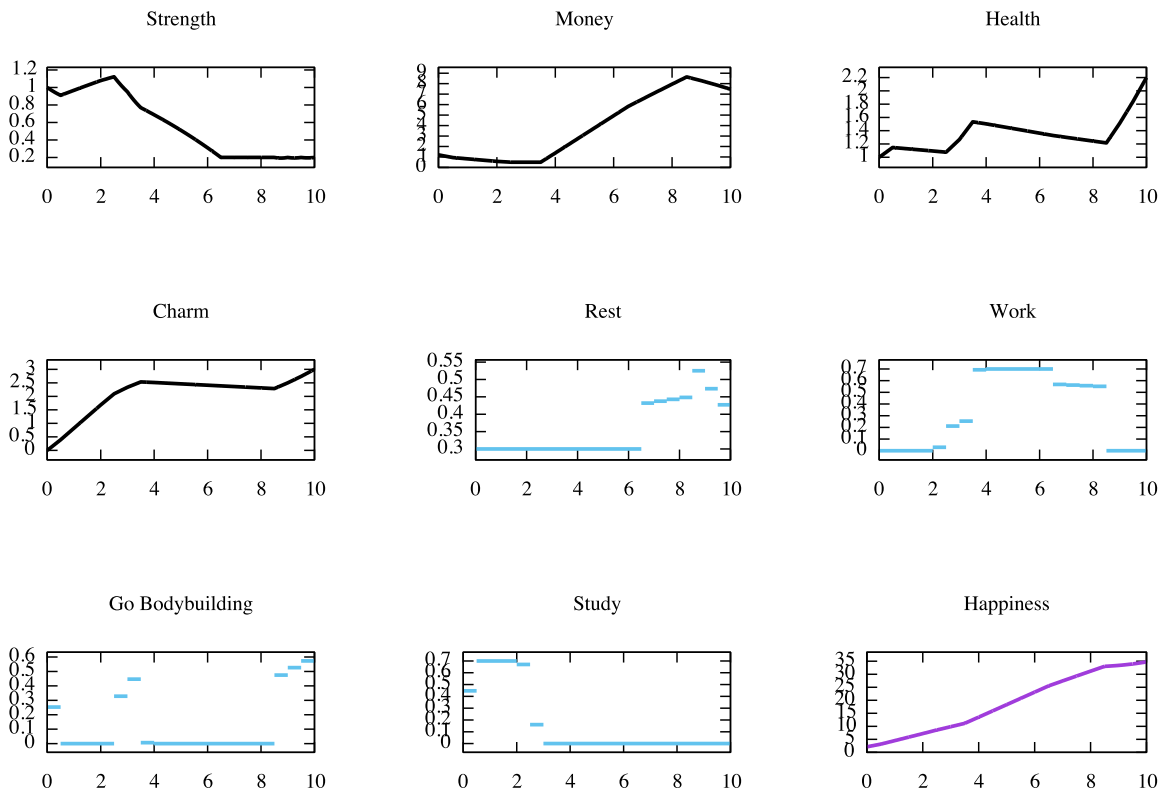
Conclusion

The nine pictures are make sense.

At the start of the 1000 days, he need to do more bodybuilding and studying, then he has enough health and experience. But meanwhile, he has almost spent all his money.Then he need to work hard to earn money. During about the first 650 days, he sleep for 0.3 everyday.After that,he become rich enough and he can do other things.After a long time working, his health will go lower, so he need to do some bodybuilding to recover his health.