COCO white paper

December 3, 2021

Abstract

COCO is a decentralized, autonomous, anonymous / named, open-source, for-profit, platform for online collaborative projects based on virtual shares.

Contents

1 問題的背景

- 我是一个从小时候（80 年代初）开始玩电脑的人，亲身经历了 programmer / hacker 文化的演变过程

- 写程式是一件很有趣的，creative 的过程

- 但后来出现了 Windows 的 收费／闭源 和 Linux 免费／开源 的对立

- Open source 软件的 **奖励机制** 一直很有问题，开发者基本上抱著「无偿奉献」的心态，很难获得和付出成比例的回报

- 最近出现了 License Zero 这种 for-profit open-source 软件条款，或许可以改变 open-source 不赚钱的问题

1.1 COCO 企图解决的问题

- 公司的**股价** 是由外在的自由市场决定（「看不见的手」）

- 公司内部的**股份**，可以由公司自行决定，这是 COCO 企图解决的问题，希望做到比现有方法更好

2 实名 vs 匿名

- All contributors are anonymous by default; They can use their real names optionally

- All contribs can be traced to their contributors; This information can be seen publicly, although the identity of the contributor may be unknown

2.1 知识产权的特点

We decide to adopt an anonymous policy because:

- Contribs are creative, informational items that can be easily recognized (seems impossible to to conceal)

- Thus it would be easy for a contributor to disclose his authorship of the contrib, outside of our platform

- Once this is known, the author's friends can cast biased votes on his contrib

- There is no way to prevent such 'collusions' except to make all the work open to public scrutiny

- Whereas, by allowing anonymity, some contributors will be less likely to suffer from negative bias (such as racism or sexism)

3 Shares

- Contributors get shares automatically when peers bid-vote on their contribs

- When an outside investor puts money into the company, his contrib is treated just like any other contrib. His investment earns him an amount of shares determined by existing share-holders in the project. This price may vary depending on the investor's outlook for the project.

4 VCS (version control system) and branching

- COCO will be built on top of a VCS (version control system) such as Git or Bazaar

- COCO provides a graphical interface to display the "history graph" of the project

- Each "contrib" in our terminology corresponds to a single or a set of commits in the VCS

- Contributors are free to create branches (alternatives)

- Branching occurs when there is a dispute whether to include a contrib or not

- After branching, all previous contribs up to that point are included in the new branch. New contributors decide which branch they want to contribute to

5 Exponential attenuation of votes

- 根据经济学统计，财富 服从 log normal（对数正态）分布
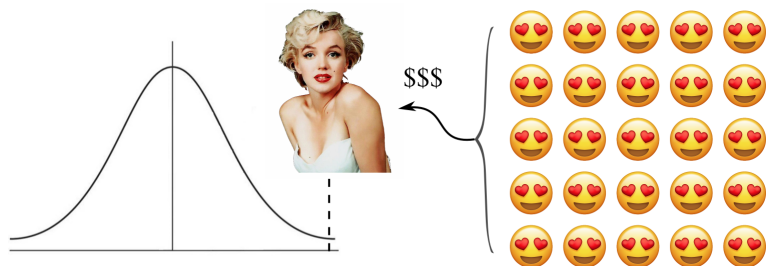 亦即是说，财富的值「取 log 之后」服从正态分布
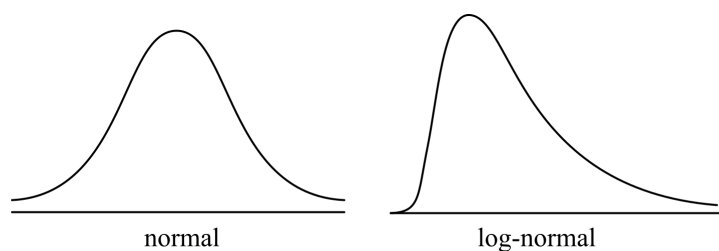
$$(1)$$

- 正态分布 是**对称**的（高个子与矮个子的比例相同）
  但财富的分布并不对称；
  富人的有钱程度（可能比平均值高出上万倍）
  远远超出穷人的贫穷程度（平均值的十分之一就是赤贫了）
  即财富分布曲线有右侧的长尾

- 正态分布 形成的原因是 很多独立的因素 **相加** 而成
  对数正态分布 则是因为 独立因素的 **相乘** 而形成

- 「成功／财富」呈 对数正态分布，
  原因似乎是因为 成功 导致的 positive feedback [*]

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[*] "Archievement is not Normal", John D Cook, 2009.
機器學習中正態分佈爲什麼常見？, 7125messi, 2018.

- 打个比方，玛莉莲梦露 在「性感」的尺度上高出平均的 1-2 个标准差 但她的粉丝的数目是 $\propto$ 当时能看到她的人口数量

(2)

- 暂时我还未完全理解 财富的 positive feedback 或 exponential 效应，它大概跟上面的论述有关

- 我个人觉得 Coco 可以用 投票得分 的 logarithm 加权，这样可以导致 更平均的奖励分配，但我暂时未能给出其合理性的一个 论证....

6 Bid-vote combination scheme

- 我们使用一种混合 bidding 和 voting 的方法，理由是 因為 成員 在 公司 中主動貢獻的 contribs **不能收回**

- 如果單靠 voting 的話，貢獻者 處於被動

- Contributor 會比較熟悉自己貢獻的價值, which s/he claims in the bidding

- Bid 和 vote 之间的 **差异**，可以表示 estimation 有没有问题，或者有争议

- The bidding can be of the form of:

  - % shares, or
  - cash amount

- Voters can respond to the bidding by:

  - agreeing
  - disagreeing, or

- suggesting a new value

- All votes are visible for public scrutiny.

- If some features (contribs) are seen to be voted unfairly, share-holders may initiate new branches.

7 User-side voting

- This is a new feature that has never existed in traditional software products

- Users (ie, buyers of the software) are entitled to vote on features (contribs) that they like, the same as when members vote on contribs

- User input can help COCO more accurately to estimate which contribs are useful

- Buyers pay for the entire project, which includes all its branches / features; They can choose to deploy any branch for usage

- By paying for the product, buyers automatically become share-holders; So they have the right to up/down-vote features (contribs) just like other share-holders

8 Use of AI or default values to automate voting and reduce "voting fatique"

Too much voting events would be detrimental to productivity. We need to reduce the number of votings and simplify the voting process. This can be achieved by default values either designed by humans or recommended by AI.

As to AI recommendation of default votes, we need to decide what is the objective for recommending such votes, given the AI's limited intelligence (assuming it does not yet understand users' contents).

9 Potential problems and possible solutions

- "Reputation" may be inaccurate when members have small # of contribs (but we focus on contribs without regard to who contributed them)

- Branching is automatic – you don't need to care about how others vote, as long as your branch works / someone buys it

- Bad voting should be penalized, but if a contributor is already low-score, the most we can do is to reduce his score to 0. But since each score is earned either by money or work, the penalty may still make sense.

- How to prevent the possibility of a significant contributor spawning fake contribs? But if all the votes are visible, the significant contributor may risk losing his reputation (in the project) even if he is anonymous.

其实 自愿 的 voting 和由此建立起的 reputation 有问题，因为 vote 别人不能带来直接的利益，而是一个 management task，传统上由 经理人 做。但如果要取代这 management 角色，则需要一个相对地完备 的机制。Manager 接受 salary，他的工作是 control tasks, monitor work and give rewards. 问题是这件 工作可不可以变成 distributive？

9.1 Free-riders 问题

按道理，那些不作为的 founders，其股份应该下跌。但怎样分辨 懒惰的 free-riders 和 要求较高的 founders？

其中一个解决的可能是：当 founders 们意见不合时可以 **分叉** (branching)，....

分叉的意义是：保留两种可能。

1. branch A accepts new contrib X

    (a) X is a good contrib

(b) X is a bad contrib

2. branch B rejects new contrib X

(a) X is a good contrib
(b) X is a bad contrib

在 (1b) 和 (2a) 的情况下，branch 1 和 branch 2 分别应该受到惩罚。

很明显，应该有 users 能判断哪个是 better branch，但实际上可能出现 branching 太多的问题，还有 users 不能分辨有没有渗入 free-riders 的分支。

但如果所有 votes 是公开的，则在统计上，始终会是较好的 branch 胜出。

9.2 Insider collusion

Typical scenario: a sub-group of insiders systematically up-vote themselves and down-vote outsiders. They share their identities and contribs among themselves, contrary to COCO's anonymity intention.

Solution: If some users see their contribs are not voted fairly, they may file complaints or initiate new branches.

首先在平台上可以查看各人投票是不是公平，如果有系统的偏差是可以侦察出来，这也是 AI 可以帮助到的，总比不记名投票好。

而且公开地「结盟」本身违反了不歧视的原则，这是平台的守则不容许的，所以那些人也只能秘密进行，而这样的秘密很难大规模地维系，那已经好像阴谋论了

其实我们现代世界越来越接受不歧视各种各样的人，我觉得这趋势只会变得更好

We may have an additional feature to penalize bad voting?

10 Calculation of shares (draft)

Assume that initially, $A, B, \ldots$ shares the company by the ratio $A : B : \ldots$. The new-comer X wants to join.

We use the same symbol A to denote the user as well as the "value" (equity) she owns in the company.

Before bidding, the fraction $\frac{A}{A+B+\ldots}$ is the % shares of A in the company $A + B + \ldots$.

In practice, the equity values cannot be known internally, we can only measure their % percentage shares. In other words, we always have the normalization

$$A + B + \ldots = 1 \tag{3}$$

and the quantities $A, B, \ldots$ are regarded as percentages.

The actual equity-value of these shares is market-determined. This is how the traditional stock market works.

10.1 Scenario 1: New-comer X offers a contrib and bids (suggests) a share amount

Each prior member (A, B, ...) would respond with the % percentage shares she thinks X may own. This respond is denoted $\sigma_i \in [0, 1]$, from 0% to 100%, where i is the member index ($A, B, \ldots$ etc).

The amount of shares X will get is given by:

$$\frac{X}{A + B + \ldots} = \sigma_A \left(\frac{A}{A + B + \ldots} \right) + \sigma_B \left(\frac{B}{A + B + \ldots} \right) + \ldots \tag{4}$$

In other words, it is the weighted-average of assigned shares.

Question: if A refuses X's contrib, ie, $\sigma_A = 0$, would A's original shares be diluted? Under the current scheme, the answer is yes, but the dilution may be reasonable / acceptable.

10.2 Scenario 2: Prior member offers a job with a share amount

In this case, all prior members need to collectively decide if the new-comer has accomplished the task, which is a binary decision ("yes" or "no").

10.3 After-bidding shares adjustment

After bidding, prior members' shares must decrease to create X's new shares.

The shares assigned to X is given by (4). So the prior members must split the remaining shares among themselves:

$$\boxed{\text{remainder}} \quad r = 1 - X/Z \tag{5}$$

where $Z = A + B + ...$, ie, the normalization factor.

Each prior member's shares can be renewed via this formula:

$$A = r \cdot \frac{\sigma_B + \sigma_C + ...}{\sum \sigma_i} \tag{6}$$

11 一些经济学理论背景

- 一班人合作创造一件 product,这件商品的 **价格** 是由 **市场** 决定的。这个思想可以追溯到 Adam Smith 在 1776 年 提出的 **自由市场** 理论,亦即是经济学里最基础的理论。而自由市场这一思想,甚至可以说 符合了 后来 Charles Darwin 在 1859 年 提出的 生物的 **进化论**。COCO 假设自由市场的基本条件成立。

- 在 1859-60's,Karl Marx 发表了《资本论》,其中提出了 著名的 **剩馀价值 理论**,认为 商品 的价值是投入的 **资本** 和 **劳动力** 的某个 **函数**。这个假设现在受到很大质疑,因为 价值 和投入的 劳动力之间,可以有非常复杂而非线性的关系。

- **股份公司** 的概念是资本主义最伟大的发明之一。**公司** (company) 制造 product,product 的价格由外面的市场决定,但合作者在公司内的 **股份** (shares) 是可以由公司内部决定的。后者就是 COCO 企图解决的问题,或许可以做到比现有方法更好。