COCO white paper

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Abstract

COCO is a decentralized, autonomous, anonymous, 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 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，也可以引入某种 penalty

- 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.

6 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

7 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?

7.1 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。

7.2 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 initiate new branches.

We may have an additional feature to penalize bad voting?

8 Calculation of shares (draft)

Assume that **initially**, $A, B, ...$ shares the company by the ratio $A : B : ....$ 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 $\frac{A}{A+B+...}$ is the % shares of A in the company $A + B + ...$

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

$$A + B + ... = 1 \tag{1}$$

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

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

8.1 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** ($A, B, ...$ etc).

The amount of shares X will get is given by:

$$\frac{X}{A + B + ...} = \sigma_A(\frac{A}{A + B + ...}) + \sigma_B(\frac{B}{A + B + ...}) + ... \tag{2}$$

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.

8.2 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").

8.3 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 (2). So the prior members must split the **remaining** shares among themselves:

$$\boxed{\text{remainder}} \quad r = 1 - X/Z \tag{3}$$

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

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

$$A = r \cdot \frac{\sigma_B + \sigma_C + ...}{\sum \sigma_i} \tag{4}$$

9 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。