

AA: the Algorithmic Autoregulation (Software Development) Methodology

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Abstract

We present a new methodology for coordinating teamwork called Algorithmic Autoregulation (AA). This methodology is based on recent social networking concepts and individual merit and exhibits convenient asynchronous, autodocumenting and autoregulating characteristics. Team members take on an egalitarian and volutary role, by logging into periodic “AA sessions” for an arbitrary duration (e.g. 2 hours per day). During each session, a user creates a log composed of short text sentences about their activity. These logs are publicly aggregated in a Website and are peer-validated, as in code review. A short screencast is ideally recorded at the end of each session to make AA logs more understandable. This methodology seems to be well-suited for increasing the efficiency of teams working on Global Software Development (GSD). Recognized reasons for this are the: 1) builtin asynchronous on-demand communication, documentation and working hours comprobatives; 2) reduced need for central management, meetings and time-consuming reports. Hence, AA legitimizes and eases activities of a distributed software team. It enables groups to have new means to fund activities, allowing for business models to emerge from distributed software development. AA is proposed, at it’s core, as a way of having self-replicating hacker initiatives. These claims are discussed in a real case-study of a distributed free software hacker team called Lab Macambira.

1 Introduction

One of the defining features of modern times is the widening geographical distribution of software teams [6]. This is responsible for the so called Global Software Development (GSD) [4]. An example is the free software movement. Projects and institutions like Mozilla Foundation has several employees and thousands of voluntary developers distributed across many countries. The same is true for GNOME [4], OpenBSD, MySQL or Apache Software Foundation, to cite just a

few¹. Along the free and open software projects, GSD has a growing popularity in every niche of the software industry as a whole, even on those distributing their software with proprietary licenses. This phenomenon is attributed to a variety of factors such as a larger labor pool, natural globalization of software companies and foundations or even the premise of cheaper cost of production [5].

Dispite the advantages of GSD, it is known how difficult it is to coordinate and fund free software on a larger scale than currently available. That is, when teams are very heterogeneous, containing not only volunteers and experienced developers, but also contractors from different backgrounds and cultures. This observations are in consonance with dedicated studies, such as [2]. As a common base, related difficulties for GSD gather around distance, time and cultural differences. In the case of free or open software projects, all these factors are involved.

Another problem faced by modern software companies and other collectives are frequent ineffective meetings, which are seldom focused on the interest of any attendant. The result is that it has become the norm to participate in these with the “laptop open”, which is unproductive. Software developers like to code, to be productive, to have their hands on their project, to do what they are best at. They dislike to have to stop for meetings or to write lengthy reports to justify their funding.

To address these matters is the purpose of AA, a methodology and an associated software system for coordinating distributed team work dealing with the disadvantages of GSD. Team members take on an egalitarian role, and stay voluntarily *logged* in the system for part of their time (e.g. 2 hours per day), during which they log a periodical short text sentence — similar to a “tweet” in this Twitter era — as the status of their activity using an easy to use command. These “microblog sentences” are publicly aggregated and validated by other team members. Through AA, the community has a methodology and an associated system to validate and enable the activities of a distributed software team. It implicitly legitimizes financial support for the expansion of the activity of the developer team as the activities are documented and validated. The AA methodology is specially useful for coordinating distributed and decentralized team work, providing effective means to asynchronously update different team members, diminishing the need for harsh synchronous meetings.

A brief overview of current papers about GSD methodologies related with AA is presented in section 2. In section 3, the most relevant characteristics of the AA methodology are outlined. In this same section, there is a description of an AA use in a team of 9 developers in the second half of 2011 and a broader a more released use of AA from 2012 until now. Finally, in Section 5, there are final conclusions and indicatives of future possibilities to the practical use of AA on other teams of software developers or individuals working on non-software activities.

[A very good article on the value of asynchronous communication for personal and

¹Ohloh, the open source network, have a more complete and constantly updated list of the most active projects on-line at www.ohloh.net

group productivity, related to the key necessity of having moments of introversion to avoid daily pressures of forced socialization. The way we work on the digital age enables people to be very productive, the article also mentions linux as a hallmark example [7]]

[TODO: cite CIA.vc bot stuff]

2 Related Work

There has been a large amount of research done in the area of methodologies to deal with distributed teams of developers. We are focusing in GSD here, however some principles involved on those methodologies could be used on smaller teams of developers working in the same place, time and with minor cultural differences. Moreover we generally think on “distributed development” being global which is not totally true. We even applied AA to a team that work at the same city but on different times (more details on Section 4). Even smaller groups of developers working on the same building could use GSD methodologies. A thorough survey of these methodologies is beyond the scope of this paper. Here we present a brief overview.

Various methodologies for GSD were built around the factors that affect distributed team works, proposed by Carmel [2] and comprising three distances: geographical, cultural and temporal. Geographical distance prejudice *coordination*, being the act of integrating all the tasks distributed between units [3]; *control*, or the process to maintain specific goals, policies or quality levels; and *communication*. All these factors are correlated, for example, a team need to have clearly communication to work on tasks of a specific problem. Cultural distance encompass differences on organizational and natural culture. Spoken language, unit and ethnic values are common forms of this distance. Some companies prefer to situate development units in foreign locations with minimal cultural distance (e.g. an American firm prefer Ireland, because of spoken language similarity [3]). And finally the temporal distance that prejudices synchronous communications like telephone or videoconferences. Units of developers working on different time-zones are concerned with managing of their agenda guided by this temporal distance.

Targeting geographical distance, Carmel [3] suggests a tactic to reduce intensive collaboration. His approach divides the whole software life-cycle on levels of complexity. Each level has a degree of collaboration. For example, some developers working on a project with high collaboration level should use the follow-the-sun approach: when concluding the work day, they pass their work to the team working on another time-zone. Other tactics are suggested by the same author to deal with the three distances, like separating foreign units of developers in time-zone bands.

Battin et al. [1] propose and argues about their experiments using specific methodologies created for the distributed development centers of the Motorola Company (which has over 25 software development centers worldwide). These methodologies included constant communication with critical units, incremental

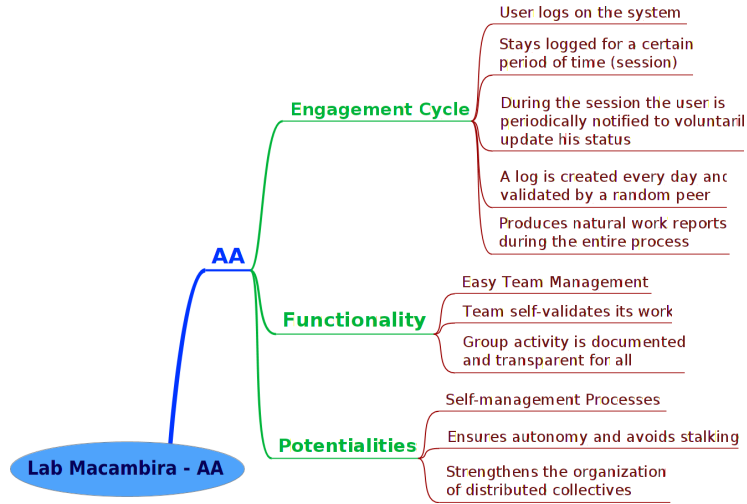


Figure 1: Mindmap of our methodology

integration and scheduled based on time-zones distributed to developers on 6 countries from 3 continents.

While considering free software projects instead of companies, the same factors are present and some methodologies arise. German [4] gives a concise review of methodologies used by the GNOME project, one of the most active free software projects and used by companies like Sun Microsystems. It is interesting to note a difference on viewpoint present on his paper: German focuses the methodology description on code. He starts explaining that GNOME is separated into modules (76 on version 2.4, to be precise) and each module has one maintainer who divides his modules into separated parts in which other developers can work on independent tasks, along other responsibilities. As like others free software projects, all the development was done using a *bugtracker* to bugs and issues management, mail lists and Internet Relay Chat (IRC) to discussion and communication and a software configuration management like SVN or Git. Periodical (commonly yearly) conferences like GUADEC is common on free and open source projects to face-to-face meeting and is based each time on a different place.

3 The AA Methodology

As noted, some strategies for GSD are based on complex methodologies and many of those were built for a specific company or software center. Here we propose an alternative methodology based on a simple idea: small working sessions logged by a computational tool. Figure 1 summarizes our methodology.

| AA | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------|------------|------------------|--------|---|---|---|---|---|
| Validar | | Data | Nick | Log | | | | |
| Usuários | | 18/04/2012 00:02 | viz | shout agora continuando a ver oportunidades de financiamento abi etc | | | | |
| | | 18/04/2012 00:02 | viz | shout escolhas disciplinas possiveis pro proximo semestre: mat discreta 1, eng software, linguagens formais e automatos ou compiladores | | | | |
| | | 17/04/2012 18:03 | viz | shout verificando questoes do pro-ciencia | | | | |
| | kamiarc | 17/04/2012 16:07 | hybrid | push | | | | |
| | AkIn | 17/04/2012 16:07 | hybrid | stop | | | | |
| | Flecha | 17/04/2012 16:07 | hybrid | shout terminados emails finais das articulacoes, saindo da casa do belsario | | | | |
| | Fefo | 17/04/2012 16:07 | hybrid | alert terminados emails finais das articulacoes | | | | |
| | | 17/04/2012 15:57 | hybrid | shout especificacao encaminhada, reunioes marcadas, visita aa ruvem.it desmarcada, vindo bus para saubate | | | | |
| | Penalva | 17/04/2012 15:57 | hybrid | alert especificacao encaminhada | | | | |
| | mquasar | 17/04/2012 15:27 | hybrid | shout terminando especificacao em: http://pontapad.me/cupula-dos-povos-CV-Riomais20 linha 255 +- | | | | |
| | hick209 | 17/04/2012 15:26 | hybrid | alert terminando especificacao em: http://pontapad.me/cupula-dos-povos-CV-Riomais20 linha 255 +- | | | | |
| | | 17/04/2012 14:26 | viz | start | | | | |
| | automata | 17/04/2012 12:55 | viz | shout computed my indprod for capes, now gathering detailed data for prociencia so that I can get more research salary | | | | |
| | viz | 17/04/2012 12:54 | viz | shout now gathering productivity information for my graduate certification as an advisor | | | | |
| | DaneoShiga | 17/04/2012 12:54 | viz | shout will record screencast soon | | | | |
| | gilsonbeck | 17/04/2012 09:06 | viz | shout lectured c++ tuto this morning | | | | |
| | | 17/04/2012 08:36 | viz | shout seeing vrb1 details | | | | |
| | ngk | 17/04/2012 08:36 | viz | shout iniciando de volta no refinamento do tuto.cpp | | | | |
| | lari | 17/04/2012 08:22 | viz | shout aa == share your Doing, not your Done | | | | |
| | | 17/04/2012 08:21 | viz | shout perfurando papelada da aula | | | | |
| | | 17/04/2012 08:11 | viz | shout refinando revisao C++ e java pra galera | | | | |
| | ofofo | 17/04/2012 08:11 | viz | push | | | | |
| | | 17/04/2012 08:11 | viz | stop | | | | |
| | teste | 16/04/2012 14:12 | hybrid | shout repassando infos para automata e para feliel no canal irc, respondendo na mao alguns casos + patologicos | | | | |
| | | | | | | | | |

Figure 2: AA Version 0.1

3.1 AA Session

From the developer perspective, the AA methodology is based on creating pretty small high perspective reports of what they are doing in a specific time frame, that can be something between 5 to 15 minutes, depending in what is more comfortable for the developer. An AA Session would be a period of at least 2 hours doing these reports. The developer can set reminders to show up when its time to make a new report. The objective of the flexible time frame and reminders is to minimize developer overhead during his AA session. In this way he can make the reports while staying concentrated in his code. Each report can be sent directly to an on-line server, or stored locally in a temporarily database for sending later. This make possible the use of AA while offline.

Developers can also record a video screencast in the end of the session summarizing what has been done, explaining with his words and showing his most important results. This, combined with the textual log of his session, makes the whole report more understandable for himself or other people searching for information about his production.

3.2 AA Website Report

All AA reports made by the developers are sent to a Web server and become public in a Website, being possible then for a manager or another developer to follow very closely the work of a developer, nearly real-time, reading each of his small reports of what he is doing right now.

Another possibility is to check older sessions to see when sometimes was done and the comments of the developer about it, since each AA post happens in a very small time frame of work, the information about what was done become

very easy to understand, instead of a long report in the end of a session.

The site is where the developer can add to his session a link for his screencast about that session, a video summary of what was done to complement the reports, useful specially on cases where the small reports were done in a hurry, because the developer did not want to lose his focus on something important at that moment.

3.3 Validation

Each AA session must be validated by another developer, it means that all reports are read by someone that will consider then valid or not and will even write commentaries about the specific session. The developer in charge of validating a session is decided randomly by the AA Web server, which send an email to the chosen developer with an URL to a validation interface.

4 Results and Discussion

The easy and effective management of teams working on GSD is the main purpose of the AA methodology. We applied this methodology to a group of 9 developers in July of 2011 on what we called Lab Macambira². The main objective of the team was to work on different free software projects, contributing directly to their development, sending bug corrections or proposing new features on their source code.

All the team members had different levels of knowledge on software development as part of large and distributed free software projects like Scilab or Mozilla. In this way, one month of training was conducted by two experienced developers, teaching the basics of use of development support tools like bugtrackers, programming languages and version control systems. After this period, a challenge was proposed for the new developers: send a bug correction or a new feature to a large free software project and you will work with us, you will be a “Macambira” developer. Table 1 summarizes the contributions of each “Macambira” to free software projects.

In one month, each developer contributed to many very large free software projects. Many of the developers started the training with no knowledge of what is free software and ended that period becoming a free software developer.

During that month, the same team developed the first version of the AA system and used AA to manage their activities. Even while developing the system. All the source code of AA — the client that sends the logs and the AA Web server — is public available³ and all the AA sessions log of the whole team of “Lab Macambira” is also on-line⁴.

²LabMacambira.sf.net: <http://labmacambira.sf.net>

³AA source code: <http://labmacambira.git.sourceforge.net/git/gitweb.cgi?p=labmacambira/aa>

⁴Logs of AA sessions: <http://labmacambira.git.sourceforge.net/git/gitweb.cgi?p=labmacambira/paainel>

Table 1: Free and open software projects that received contributions from “Macambiras”. On the first column we can see a list of applications of those projects. At right, the pseudonym of the “Macambiras” who sent *commits* to the application. At “Lab Macambira”, and at free software community in general, is a common practice to use pseudonym as identification.

| Application | “Committers” |
|-----------------------|--|
| Mozilla Firefox | daneoshiga, bzum |
| Evince | hick209, bzum, marcicano, mquasar |
| BePDF / Xpdf | marcicano |
| Ekiga | flecha |
| Empathy | fefo |
| Lib Folks (Telepathy) | kamiarc |
| Scilab | v1z, humannoise |
| VxL | v1z |
| ImageMagick | v1z |
| OpenOffice | hick209 |
| Puredata | v1z, automata, greenkobold, gilson, bzum |
| Puredata OpenCV | v1z |
| Puredata GEM | v1z, fefo, hick209 |
| Puredata PDP | v1z, fefo, hick209 |
| ChuckK | rfabbri, automata |
| ChuckK MiniAudicle | rfabbri, automata |
| WebRTC | automata |
| OSC-Web | automata |
| Web-PD-GUI | automata |
| Live-Processing | automata |
| ChuckK-Wiimote | automata |
| Audiolet | automata |
| Extempore | automata |

After the training period, during more 6 months, the “Macambiras” worked on a large range of free software projects, distributed on work groups — each work group focusing on a specific theme like video, audio and web — and financed by contracts and support of the “Pontão Nós Digitais”. In Table 2 we can see a list of the free software created by “Lab Macambira” since July of 2011.

As of this writing the “Lab Macambira” have many software developers, and some of the trained developers continue to work voluntarily in the project.

5 Conclusions

In a scenario where GSD is growing as a popular form of software development, not just on free software projects but in the whole software industry, we need methodologies to deal with its disadvantages and at the same time to amplify its advantages.

This paper has presented a methodology to GSD, being the development conducted on large or small groups of software developers, working on different countries or even at the same room. The AA methodology implements a simple system where each developer take notes of his work generating a periodical log of small text sentences. The sum of those sentences, along an entire session of work, results in a complete report. The report is made public available through a Website and be validated by other developers sorted aleatory by the AA Web server.

Instead of a merely work-management tool, AA act as a methodology to improve the time sense of individuals, dividing their work on small sessions, and also reducing the need of extensive reports or unnecessary meetings. By asking users to write a minimal text sentence as a continuously log, AA does not disturb developers concentrated on programming: developers just have to type some characters, hit *enter* and go back to coding.

AA application is not restricted to software development. As of this writing there is a comic book studio ⁵ starting to use AA to manage their activities. People with non-software background, like social scientists, musicians and activists has also using AA and contributing for its improvement.

For developer teams, we have experienced the use of AA to auto-regulate the work of “Lab Macambira”, a group of free software developers from Brazil. Since July of 2011 the group have contributed and created new free and open source software for a vast number of applications.

There are many aspects of the work which remain unfinished. New ways to report logs — the “Twitter like” messages — from different interfaces like IRC, Internet Messaging services and email can make the use of AA easy and widespread, turning AA an ubiquitous system, presented on everyday communication channels. Even the work logs generated since July of 2011 could be vastly statistically analyzed aiming to recognize patterns in the behavior of individuals and their productions.

⁵Pula pirata: <http://pulapirata.com>

Table 2: Software projects created by “Lab Macambira” since July of 2011 with a short description and the technologies — like programming languages or frameworks — involved. It is interesting to note the heterogeneity of projects and its areas of application.

| Application | Description | Technologies involved |
|--------------------------|--|-------------------------|
| AA | Algorithmic Auto-regulation | Python, PHP |
| Ágora Communs | System for on-line deliberations | PHP |
| SIP | Scilab Image Processing toolbox | C, Scilab |
| animal | An Imaging Library | C |
| TeDi | Test Framework for Distance Transform Algorithms | C, Shellscript, Scilab |
| Macambot | Multi-use IRC Bot | Python |
| “Conferência Permanente” | Platform for the permanent conference of the rights of minors | PHP, JavaScript |
| CPC | Center for accounting of the Brazilian culture representation groups | Python, Django |
| Timeline | Interactive time lines on the Web | JavaScript |
| Imagemap | Interactive marking for on-line photos | JavaScript |
| ABT | Program for real-time execution and musical rhythmic analysis | Python |
| EKP | Emotional Kernel Panic | Python, ChuckK |
| SOS | Aggregation and diffusion of popular and native knowledge about health | Python, Django |
| Creative Economy | Platform for creative, collaborative and solidarity economy of the culture hubs and cultural entities | Python, Django |
| OpenID Integration | Adaptations to existing software for unified login through OpenID | PHP |
| pAAinel | Dashboard for the real-time visualization of Lab Macambira activity | Python, Django |
| Georef | Collection of scripts to be used as reference, which aims to be a GIS platform to map public data of use to citizens | Python, Django |
| AirHackTable | Software for an instrument which generates sound from flying origami tracked by webcams | Puredata, C/C++, Scilab |

We would like to conclude setting an important role of AA: being a free software system and an open methodology, AA could be used to auto-manage groups of individuals working on software or other kinds of activities. In this way, we are interested to spread AA for those groups, to have even more developers contributing in a collaborative way.

Acknowledgments

We would like to also thank AA: the present research and even this manuscript was written using AA. The complete log is on-line at <http://www.pulapirata.com/skills/aa>.

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