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Bringing Game Achievements and Community Achievements Together

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Abstract: When s*ocial media* is used for game-based learning one major issue is the rewarding of players for their efforts to provide user-generated content to others (*peer tutoring*). This can be done by rewards and achievements gathered within the game or when content is created within a game-related community platform. For *serious games* that foster the knowledge exchange among peer learners (players) the rewarding and tracking of both - in-game and in-community assistance for help among learners - is desired. Thus we propose an architecture and solution for an integrated achievements-system which allows the combination and rewarding of player activities in games and related communities at the same time.

The *Achieve2Conquer* platform provides game developers with a middleware architecture where achievements are created, visualized to users within a web-frontend and updated by progress information from game instances and community platforms simultaneously. The architectural model of *Achieve2Conquer* allows a weight balancing of achievements from game and community, to prevent an overrating of one of them. In unbalanced achievement systems this may otherwise lead to an extensive use of community-based achievements by eager players due to the fact that these achievements are usually available unlimited (e.g. like achievements for being the first person commenting a new post). Additionally we propose new achievement types for hybrid achievements and user-generated or user-awarded achievements to combine existing reward models of both worlds (games and social media applications). These allow the guidance of players, e.g. by first requesting achievements parts to be achieved within the game environment, then by conducting actions in the community and finally requesting a collaborative aspect. Additionally our new achievement type of reversible achievements allows to discourage undesired player behavior and still does not violate the expected characteristics of achievements.

After a brief description of current models for reward systems, reputations systems and achievements for games and achievements in social media communities, the requirements for an achievement system supporting the combination of both, game and community, are defined. Afterwards we provide the Achieve2Conquer model with its achievement categorization, the necessary achievement components and the new achievement types as the core contributions of this publication. A prototypical implementation will then be presented with a middleware architecture connecting the existing serious game *Woodment* and a phpBB community bulletin board.

Keywords: Peer Learning, Achievement System, Community Achievements, Serious Games Technology, Social Serious Games

1 Introduction and motivation

Social media platforms are a vital source of information for learners. Beside pure learning platforms like Open University[1], social media platforms are used to exchange knowledge about learning content and computer game solutions(Li et al. 2011; Denny et al. 2008). While major game publishers provide their own game-related community-platforms (e.g. *BattleNet*[2] from *Blizzard*), for most computer games the discussions take place in stand-alone community-platforms related to the specific game.

Especially for *Serious Games* it is desirable to foster a knowledge exchange among the players related to the quests and learning aspects of the game. At the same time such games normally do not provide in-game community features due to limited resources in the game development process. Even though an in-game community and exchange would be the most seamless solutions to emphasize exchange among players, it is a much more cost-effective and suitable solution to provide a community-platform for the players based on existing social media solutions (e.g. like wiki systems of Wikimedia[3] or bulletin boards from phpBB[4]). Players can then provide their hints and solutions for

[1] http://www.open.ac.uk/
[2] http://battle.net/
[3] http://www.wikimedia.org/
[4] https://www.phpbb.com/

specific game quests (and related learning targets) to others. Then knowledge exchange among the learning peers happens based on the user-generated content stored within such social media platforms(Konert et al. 2011). If this content is provided with respective meta data about the game quest, player, solution characteristics and game-specific information then other players can find such content faster and more effective (Konert et al. 2012). The providers of answers to questions of other players are rewarded by the comments, (positive) ratings and feedback. Still, the incentives to provide such content are limited, even though one major motivation for creators of user-generated content *is* fun/entertainment (Stoeckl et al. 2007). As computer game players are rewarded within the games directly (e.g. by an achievement system), it seems suitable to reward community-based activities, too. Such a system can provide incentives for players of computer games to not only master the game and collect all game achievements, but as well try to get the achievements provided for community-based activities. If all achievements are then integrated into *one* achievement system, players can be rewarded in a balanced and adjunctive way for progress on both sides: in game advancements and in-community content creation (or consumption).

2 Related work

To the best of our knowledge no model for an achievement system exists yet that focusses on the combination of game-based and community-based achievements in one system. Thus we discuss here existing reward systems, reputations and achievement systems for games and communities separately to derive the proposed model.

2.1 Reward systems

To achieve a goal in a computer game users receive manifold feedback by the game: positively in case they solved a problem or make progress and negatively in case they did something wrong. The negative feedback may appear in form of energy decrease, game termination or setbacks. These special rewards, so called *false rewards* (Juul 2009), help players to learn how to master the game.

In general the primary purpose of reward systems is to provide additional incentives and motivation for players to experience the full spectrum of a game. Reward systems can be viewed as player motivators or as compromises for easing disappointment. Wang & Sun (2011) identify eight forms of rewards in computer games:

R1. Score systems
R2. Avatars (e.g. experience systems, leveling)
R3. Item granting systems (collecting and social status)
R4. Resources (practical game currencies)
R5. Achievement systems
R6. Feedback (direct positive emotional intensifier)
R7. Animations and pictures (milestones and game story enrichment)
R8. Unlock mechanisms (for access to game content)

Even though achievement systems (R5) are by themselves a form of rewards it can serve as a whole rewarding system, because achievements contain rewards (like R1-R8) issued to the player when receiving the achievement.

Additionally, in modern computer games reward systems also provide a strong social meaning to players. Their player dossiers reflect the rewards and are mostly shown publicly to other game community members. As such, the interconnected players and their visible profiles serve as *social capital* (Ellison et al. 2007). Analogue to the social capital in the communities, *gaming capital* can be drawn from the knowledge about the game mechanics, quests and game industry (Consalvo 2007). Both, social and gaming capital, are made visible (in parts) by the collected rewards (and the visible completed achievements).

From the focus on role playing games Hallford & Hallford (2001) classify rewards into four types that can be mapped to the eight reward forms listed above (mapping in parentheses):

1. *Rewards of Glory* (no direct impact to game play, e.g. R1, R5, R6, R7)
2. *Rewards of Sustenance* (social status and progress, e.g. R2, R3, R4, R5)
3. *Rewards of Access* (unlocking content, e.g. R8)
4. *Rewards of Facility* (abilities and enhancements, e.g. R2, R3)

2.2 Reputation systems

As achievement systems serve as well for the representation of social status as described above, the visibility to others relates to reputation systems, which allows access to “a summary of one’s relevant past actions with the context of a specific community presented in a manner that can help other

community members make decisions with respect to whether and how to relate to that individual" (Dellarocas 2010, p.2). Consequently, a reputation system is only useful in a multiplayer context where a community of players is interconnected. An example of such a system is integrated with Yahoo Answers[5]; a platform that addresses all of the four objectives users expect from a reputation system as proposed by Dellarocas: *trust building* (to differentiate good from bad), *filtering* (to identify good content and contributors), *matching* (to identify resources matching a users' profile) and *user lock-in* (to keep users attached to the platform maintaining their reputation profile).

To address these objectives with an achievement system, Dellarocas propose four key questions to address as listed in Table 1. We answer these questions according to the targeted achievement system.

Table 1: Key decisions for the design of reputation systems (Dellarocas 2010, pp.3–4) and the answers according to *Achieve2Conquer*

Key decision	Answer in relation to this publication's achievement system
What actions are relevant to include in one's reputation profile?	The progress of all achievements and their time of completion should be included, as well as all available and already earned rewards
How to obtain information about relevant user actions?	Generally, there is the choice between internally generated (firsthand) information and feedback provided by others (secondhand). Achievement systems commonly obtain their information firsthand by monitoring the user actions (e.g. with trigger-events). Exceptions are *user-awarded achievements* (see section 3.2.3).
How to aggregate and display reputation information?	A variety of methods is possible: simple statistics (e.g. number of completed achievements), star ratings (e.g. rating how good an achievement was completed), numerical score (e.g. achievement points), numbered tiers (e.g. level-based achievements), leaderboards (e.g. highscore lists, commonly not included in achievement systems, but possible)
How to deal with manipulation and gaming?	No incentives (achievements) for undesired user behavior should be given. As the achievement is usually tight to a trigger and is as well limited, manipulation is only fractionally possible. Still, a manipulation-resistant achievement-based reputation system is impossible to design if the underlying game is prone to manipulation.

2.3 Game-based achievements

Achievements have a long tradition for games; especially in sports where the best three participants of a discipline are rewarded (e.g. at *Olympic Games*). Achievement systems serve as a meta game if they are comprehensive and visualize achievements of several games at once, e.g. like the XBOX Live system (Jakobsson 2009). Then the achievements are designed independent of game and genre (Hamari & Eranti 2011).

In contrast to the general motivations for playing as discussed at the beginning of chapter 2, a more specific list regarding the motivation related to achievements contains (1) *social status*, (2) *completionism* and (3) *extended play time* (Montola et al. 2009). Based on expert interviews Montola et al. found fourteen categories of achievements addressing these factors:

A1. Tutorial (trying and learning features of the game)
A2. Completion (finish a sequence of the game)
A3. Collection (complete a collection of game items)
A4. Virtuosity (play sequences perfectly)
A5. Hard Mode (succeed on difficult levels)
A6. Special Play Style (master parts of the game with even more restrictions like fast-running)
A7. Veteran (quantitative accumulation of game items like currency)
A8. Loyalty (playing regularly)
A9. Curiosity (discovering unexpected secrets or master unlikely situations)
A10. Luck (getting a rare item)
A11. Mini-Game (success in mini-games)

[5] see http://answers.yahoo.com/

A12. Multi-Player (outstanding performance in multi-player scenarios)
A13. Paragon (being rewarded for pioneer activities)
A14. Fandom (attend out of game activities like purchasing merchandise articles)

Orthogonally to the categorization games provide some achievements as *hidden achievements* which are not visible in the list of available achievements. They appear when completed. Thus the completion logic and requirements are unknown for players and such the achievements are usually seldom and provide *Rewards of Glory* (Montola et al. 2009).

2.4 Community-based achievements

The majority of research publications and studies relates to achievements in computer games and seldom focus on achievements in social media platforms and communities. Even though rewards and reputation systems exist widely to encourage users to not only passively consume, but actively contribute content to the social media communities, achievement systems could additionally help to foster content creation and break the rule that only 1% of users contribute content (Arthur 2006), while all others only consume (so called *free riders*). Especially for game-based learning or for *Social Serious Games* that interconnect players of Serious Games for knowledge exchange, such achievements can support the creation of new tutorials, solutions and answers to questions (Konert et al. 2012). Such users contributing content without direct benefit for them are called *zealots*.

Factors influencing the willingness of users to contribute content are

- Cost / benefit ratio
- Incentive system
- Extrinsic / intrinsic motivations
- Social capital
- Social and personal cognition

(Chen & Hung 2010). An achievement system for game-based and community-based achievements can address most of the factors and thus influence the contribution positively. As achievements can be an additional incentive the cost / benefit ratio profits from provided achievements. As such it is by itself an incentive system and can positively increase the extrinsic motivation when the achievements offer rewards on completion. As publicly visible achievements serve as reputation systems and social capital at the same time the last two aspects are covered as well, if such a system is added to community systems.

Different to the categories for game-based achievements listed in Chapter 2.3, Montola et al. (2009) have identified seven categories for achievements in social media communities (categories overlapping with the game-based achievement categories have been marked italic):

C1. Tutorial (visit and read parts of the community-stored content)
C2. Participation (actively contribute to gatherings, votes, discussion threads)
C3. Instructor (provide hints, solutions, guidelines)
C4. Moderator (administer content and like/dislike elements)
C5. Wiki Author (improve the knowledge base)
C6. Veteran (participating a lot in activities)
C7. *Completion* (focusing on completion of all achievements or a sequence)

2.5 Achievement definition

As achievement systems can be defined game and genre independent, a general achievement structure definition is possible. The parts listed in Table 2 are derived and extended from Hamari & Eranti (2011).

Table 2: achievement component definition, based on (Hamari & Eranti 2011)

C.	sub component	description
Signifier	*The signifier is defined in the achievement system and consists of the visible parts*.	
	Name	The name of the achievement
	Visual (optional)	The visual representation that is commonly related to the name and the description.

	Description	A textual description of the central parts of the unlocking logic of an achievement, or a vaguer hint as well as the description of the rewards.
Completion logic	*The completion logic is defined through mechanics in another system (e.g. game or community platform)*	
	Pre-requirements	Pre-requirements are conditions for the game session that have to be met in order to allow the trigger or the other conditions.
	Trigger	Trigger is either a user action or a system invoked event.
	Conditions	Conditions include the requirements directed to the system state or to historical events in the system fulfilled in the past.
	Multiplier/Counter	The amount of times the trigger has to go off while all pre-requirements and conditions are met.
Reward	*Defines the reward(s) a user acquires after unlocking the achievement*	
	in-game/ in-community	Rewards related to the game or community (e.g. R2, R3, R4, R6, R7 or R8).
	Achievement game	Rewards related to the achievement system (e.g. R5).
	out-game/ out-community	Rewards external to the achievement system, the game and the community (e.g. R1 or R3).

3 Model for game-based and community-based achievements

Based on the related work the requirements for a combined achievement system, categories and the newly proposed achievement types are defined.

3.1 Requirements

Beside the fact that a combined achievement system should support all features listed above for game-based achievement systems and community-based achievement systems separately, we can derive requirements resulting from the combination of both. The *Achieve2Conquer* model may support the combination of activities to enable the creation of achievements that encourage users to switch between game and community. Additionally the achievement system must address the balancing of achievement points between game and community that none dominates the other unintentionally. As in social media communities the creation of content is a crucial aspect, the creation and awarding of achievements from users for users (user-generated) should be supported, too. Finally achievements can be used to discourage undesired behavior without violating the achievement characteristics. This supports the improvement of the content quality (especially for achievements related to user-generated content creation).

3.2 New types of achievements

Based on the existing research results and models the following new achievement types are proposed.

3.2.1 Qualitative and quantitative achievements

The authors of this publication propose a categorization of achievements into two types: *qualitative and quantitative achievements*. Most achievements in computer games are measured quantitatively and can be split up into achievement levels. All levels of a group of achievement share a multiplier/counter and the progress can be shown by the percentage of completion. These *quantitative achievements* are usually not rare, visible and related to the categories A2 (Completion), A3 (Collection), and A7 (Veteran). On the contrary, *qualitative achievements* have a binary status and cannot be expressed as a percentage of completion and are normally not split up into levels. They reward unusual game play behavior, may be seldom and represent rewards of glory or sustenance. They change the player's perspective onto the game (e.g. A6 Special Play Style or A9 Curiosity).

3.2.2 Cooperative achievements

Achievements can be designed to be completed by a single user or a group of them. Achievements that require more than one participant are defined as *cooperative achievements*. They can be further split up by the time-dependency of the actions into *synchronous/asynchronous cooperative achievements*. In community-based achievements the activities might be mostly asynchronous, e.g.

participants get the achievement when one is creating an item and another participant successfully re-edits this contribution. In games an example of a synchronous cooperative achievement is the cooperative solving of a multi-user quest to unlock an A2 (Completion) achievement.

3.2.3 User-generated and user-awarded achievements

If the achievement system allows the creation and addition of new achievements, users can be granted the right to define new achievements by themselves. Then they need to create and define the signifier, completion logic and rewards. This can be suitable and working if the completion logic and rewards are definable by users either via programming code directly or with selection from a catalogue of requirements, triggers and rewarding effects/actions. Even more attractive are *user-generated achievements* in sandbox-games where users themselves create game play within the games (like in *Minecraft*[6]. If the created achievements do not use pre-requirements or conditions from the game, but are awarded by peer votes the achievements are called *user-awarded achievements*. Still, the *user-awarded achievements* must not be *user-generated* but can be pre-defined by game designers (e.g. like an achievement for the most famous player of the month awarded by peer votes).

3.2.4 Reversible achievements

Reputation systems and their relation to achievements have been discussed in chapter 2.2. The most relevant objectives for game-based and community-based achievements are *trust building* and *user lock-in*. As reputation systems normally reflect the desired and undesired behavior of a participant, achievement systems normally only reflect the positive progress. Instead of establishing a reputation system in parallel to the *Achieve2Conquer* model we propose so called *reversible achievements* which can reflect the occurrence of undesired behavior. They will be mostly *quantitative achievements* and reset their magnifier/counter in case an undesired behavior (or event) occurs. Thus the user has to re-start with collecting the objects necessary for the achievement. Such achievements can even be designed as level-based achievements and can e.g. reflect the ratio between positive and negative comments to user-generated items. As it is unexpected and strongly discouraged to revoke once unlocked achievements, it is suggested to never revoke an achievement (or level) once it has been completed. Still, such achievements can reflect rating and reputation functionality.

3.2.5 Hybrid achievements

As a natural consequence of combining game-based and community-based achievements into one system that visualizes them together, it is suitable to define achievements which require the user to complete actions in-game and in-community. Such achievements are called *hybrid achievements*. They can provide a stronger binding between players who are more active in the game and players more active in the community. It is expected that they foster as well the content creation in the community systems by very experienced game-players as described earlier.

3.3 Combined categories of rewards

As described, Wang & Sun (2011) identify eight forms of rewards in computer games. Furthermore they argue that the last two (R7, R8) are not applicable to communities. In contrast to this, we argue that even though they are less usual, these two categories can be applied to communities as well. *Unlock mechanisms* are already part of the reward system of *Yahoo Answers* where users gain more rights when successfully answering other users' questions. *Animations and pictures* can as well be part of rewards gained within communities, e.g. to decorate a user's profile or extend the list of possible items storable. Thus the categories for game-based and community-based rewards in an achievement system are identical.

Additionally we add the reward category of *Reputation/Prestige* even though some of the achievement types cover the aspect of prestige already (like *hidden achievements*). It is still a valuable reward category and plays an important role especially in community systems.

R1. Score systems
R2. Avatars (e.g. experience systems, leveling)
R3. Item granting systems (collecting and social status)
R4. Resources (practical game currencies)
R5. Achievement systems
R6. Feedback (direct positive emotional intensifier)
R7. Animations and pictures (milestones and game story enrichment)
R8. Unlock mechanisms (for access to game content)
R9. Reputation/Prestige

[6] See http://www.minecraft.net

3.4 Combined categorization of achievements

Based on Montola et al. (2009) we define a complete list of achievement categories with a description for game-based and community-based implementations in Table 3.

Table 3: Categorization of game-based and community-based achievements, based on (Montola et al. 2009)

Category	Game-based description	Community-based description
Tutorial (qualitative)	Trying and learning features of the game	Visit and read parts of the community-stored content
Veteran (quantitative)	Accumulation of game items like currency	Participating a lot in community activities
Collection (quantitative)	Complete a collection of game items	Take part in discussions, collect votes, collect answered questions (or best answers)
Completion (quantitative)	Finish a sequence of the game (or everything)	Complete all community achievements or a specified collection.
Curiosity (qualitative)	Discovering unexpected secrets or master unlikely situations	Contribute content about a game curiosity. (community feature: curiosity votes)
Cooperative (both)	Outstanding performance in multi-player scenarios.	Solve a crowd-sourcing task, e.g. participate in a survey or tag community elements.
Virtuosity (qualitative)	Play sequences perfectly	Be a community role model; e.g. always get a high rating for content.
Fandom (neither)	Attend out of game activities, like purchasing merchandise articles	Attend out of community fan activities; e.g. fanfests
Loyalty (neither)	Playing regularly	Contribute to the community regularly
Luck (neither)	Getting a rare item	Perform an unlikely activity (e.g. the first post of the day)
Mini-Game (neither)	Succeed in mini-games	Succeed in mini-games
Paragon (qualitative)	Being rewarded for pioneer activities	Being rewarded for pioneer activities
Special Play Style (qualitative)	Master parts of the game with even more restrictions; like fast-running	Master activities in the community with more restrictions; like answering a question within 30 seconds (with good rating)
Hard Mode (qualitative)	Succeed on high difficulty level	-
Moderator (qualitative)	-	Administer content and like/dislike elements
Instructor (qualitative)	Assist other players in the game (side-kick or follow-mode)	Provide hints, solutions, guidelines

3.5 Addressing the balancing

When combining game-based and community-based achievements the ratio of achievement points partitioned among them has to be fixed. Otherwise inflation can cause the achievements of one side to be meritless. Thus, the design of the achievements needs to take into account limits for each achievement. For example, a user can only gain once the achievement for being the first commentator on a new item. Such achievements can as well be split into levels as long as there is a defined maximum (100 first comments, 1000 first comments, ..). Consequently it can be guaranteed that the ratio between the achievable points and achievements of both parts (game and community achievements) is maintained.

If the game or community allows an unlimited number of achievements (e.g. in sandbox-games with *user-generated achievements*) it is suggested that *both sides* allow the creation of new achievements to let the player-community balance the achievements. In such an environment the time needed for an achievement should be balanced that it takes the same time-effort to achieve a specific amount of achievement(s) (or achievement points) in the game and in the community. Still, there needs to be a maximum time-counting per achievement. For example, if the maximum is reached for a specific achievement, it is displayed as completed (100%) but the time spend is still updated (but no more achievement points or rewards are given).

4 Implementation

4.1 Middleware architecture

The implementation of *Achieve2Conquer* has been made as a middleware with public APIs for the game-instances and the community-instances to inform the central system about unlocked achievements. Due to the necessity to listen to system status changes in the game and/or the community, the completion logic of the achievements had to be implemented in the respective environment. An architectural diagram can be seen in Figure 1.

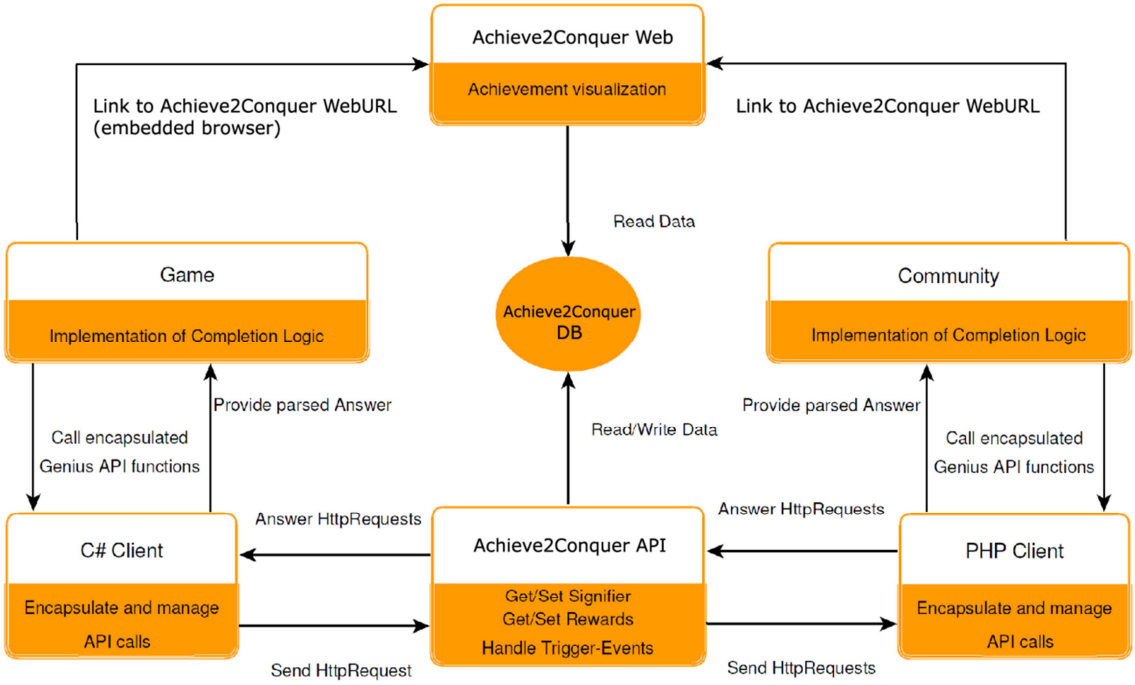

Figure 1: Architectural diagram and information flow of *Achieve2Conquer*

4.2 Achievement types

We connected the Serious Game *Woodment* (Wendel et al. 2010) and a new instance of the bulletin board software phpBB with C# and PHP client implementations to the *Archive2Conquer* middleware and added in each platform three new achievements. For efficiency reasons the achievements are listed within *Woodment* as well as a website that is generated and delivered on a template base by *Achieve2Conquer* and displayed in an embedded browser directly in the game. Thus, the achievements are listed for community and game likewise as a website (see Figure 2).

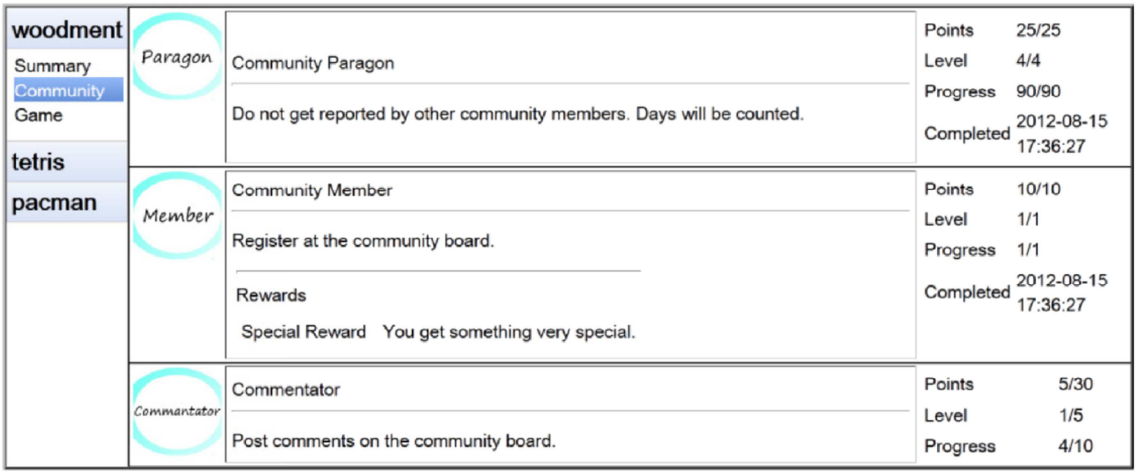

Figure 2: Web-based visualization of achievements; here the community achievements.

5 Conclusions

The main contribution of this publication is the consistent categorization of achievements for the combination of game-based and community-based achievements based on a review of existing achievement classifications, reward systems and reputation systems. The requirements and features to be fulfilled by such a new system have been described and new achievement types were defined to bring community and game closer together. They fulfill the requirement of discouraging undesired user behavior (reversible achievements), the possibility to combine activities in both worlds (hybrids) and provide a solution for *user-generated achievements* and allow the user-based awarding of achievements based on votes. The classification into *qualitative and quantitative achievements* and the discussion of the aspect ratio allows the design of balanced achievement systems. Finally a prototypical implementation and connection to the Serious Game *Woodment* and an instance of the bulletin board software phpBB showed the ease of usage.

The focus of this publication was on the theoretical aspects, but in future work a sophisticated user study is desired with all achievement types implemented to measure the user experience and impact the combined achievement types have on learning with computer games and the knowledge exchange in the connected community platform (e.g. facebook or phpBB).

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