

# TOWARDS A MODEL AND A TEXTUAL REPRESENTATION FOR LOCATION-BASED GAMES

Cristiane Ferreira, Carlos Salles, Luís Maia, Fernando Trinta and Windson Viana  
{cristianeferreira, luissantos, fernandotrinta, windson}@great.ufc.br, csalles@deinf.ufma.br

## INTRODUCTION

LBGs (Location-Based Games) are a popular sub-type of Pervasive Games. They use the players' location to update the game state during runtime. As a consequence, players have to move in the real world to progress and reach goals in the game. NCL (Nested Context Language) allows media synchronism, ordering of media execution, and the use of conditional triggers. This last feature enables the definition of actions to be executed as responses to certain conditions.

## LEGAL

LeGaL (Location-based Games Language) is an extension of the NCL multimedia language that includes specific elements to support the design of LBGs. The proposed language allows the description of rules and mechanics of LBGs. LeGaL specifies the modelling of game missions in a textual document. This modelling includes the game structure, its components, and specifications about the media used in game mechanics.

1)	Type/subtype	File format	Type/subtype	File format
	text/plain	txt	image/png	png
	image/jpeg	jpg, jpeg	audio/mp3	mp3
	video/mpeg	mpeg, mpg	video/3gpp	3gp
	text/plain	obj, mtl	application/gml+xml	gml

3)	Property	Values	Description
	mandatory	true/false	Defines whether a mission is mandatory
	occurrence	Positive integer	Sets how many times the mission can be performed
	visibility	true/false	Indicates if a mission can be executed
	requirements	List of values	Stores a list of required missions

2)	Value	Description
	0	Run a media
	1	Catch a media
	2	Create a media
	3	Drop a media

Tables: 1) Media types; 2) Actions parameters; 3) Mission properties

```
1 <?xml version="1.0" encoding="ISO-8859-1"?>
2 <ncl id="" xmlns="http://www.ncl.org.br/NCL3.0/EDTVProfile">
3   <head>
4     <descriptorBase ... > <!-- descriptors --> </descriptorBase>
5     <connectorBase ... > <!-- connectors --> </connectorBase>
6   </head>
7   <body>
8     <port ... /> <!-- initial ports -->
9     <context ... > <!-- missions -->
10      <port ... />
11      <media ... > ... </media> <!-- media objects -->
12      ... <!-- relationships between media --> ...
13    </context>
14    ... <!-- relationships between missions --> ...
15  </body>
16 </ncl>
```

Figure: Basic code structure of LeGaL

A LeGaL document can be translated into a directed nested graph, where nodes and edges are used to describe LBGs concepts. Some main reused elements of NCL are: context and media nodes, connectors, links, interface points. Some elements added to contemplate LBGs characteristics are: mission properties, player actions, scores, location data, spatial events, AR (Augmented Reality) media.

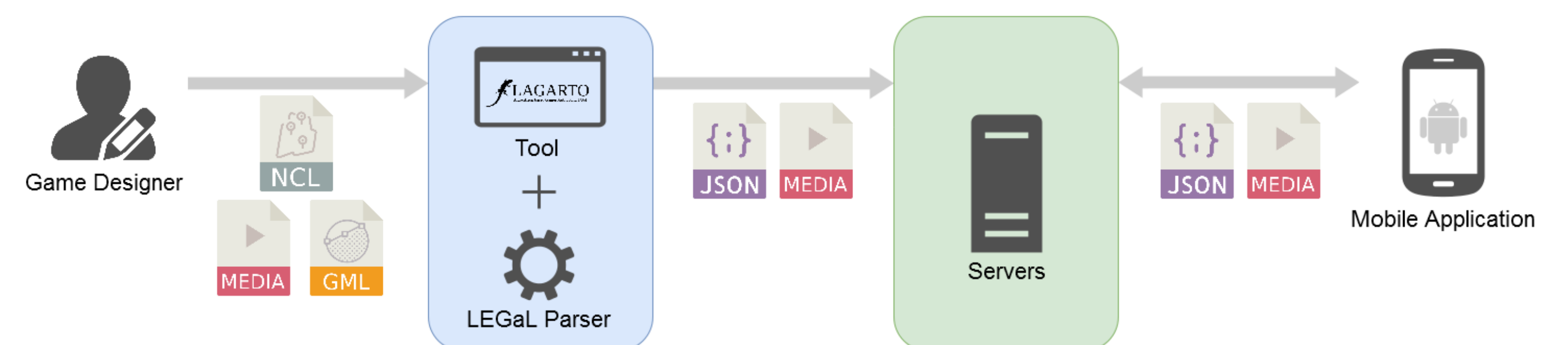


Figure: LeGaL parser integration

## PROOF OF CONCEPT

This PoC deals with the modeling and rewriting of the game AudioRio. The game consists of an audio-guided tour by points of interest where there was a river (the Pajeú) in downtown of a metropolis at South America. The player must visit these points (on a pre-established route) and listen to an informative audio at each point.



Figure: AudioRio for Android

Figure: AudioRio mission described with LeGaL

AudioRio consists of 18 missions. Each mission is composed of two media: a text and a location file, and the relationship between them. The player can start on any mission and the missions do not have an order of accomplishment. So, we declared a start port for each mission node. Each game mission of is a geo-located map point, and it have a radius of action.

## FINAL CONSIDERATIONS

In this paper, we presented the first effort to modelling and represent this kind of game. We proposed a language (based on NCL) that allows the intuitive and precise representation of the mechanics and rules of an LBG. With the structure and media of LBG represented as NCL document, game developers would in the future take benefit from tools that edit, test, and check NCL documents.

## REFERENCES

- [1] Maia, L., C. Nolêto, M. Lima, C. Ferreira, C. Marinho, W. Viana, and F. Trinta. LAGARTO: A LocAtion based Games AuthoRing TOol enhanced with augmented reality features. Entertainment Computing. 2017.
- [2] Soares, L. F. G., G. F. Lima, and C. S. Soares Neto. "NCL 3.1 Enhanced DTV Profile." Workshop de TV Digital Interativa em WebMedia. Vol. 1. No. 2. 2010.
- [3] Randell, D. A., Z. Cui, and A. G. Cohn. "A spatial logic based on regions and connection." KR, 92, 165-176. 1992.