



ESCUELA SUPERIOR DE INGENIERÍA

INGENIERÍA TÉCNICA EN INFORMÁTICA DE GESTIÓN

Dominous: simulador libre de dominó

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18 de junio de 2011



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INGENIERO TÉCNICO EN INFORMÁTICA DE GESTIÓN

DOMINOUS: SIMULADOR LIBRE DE DOMINÓ

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Cádiz, 18 de junio de 2011

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Agradecimientos

Me gustaria agradecer y/o dedicar este texto a ...

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Notación y formato

Aquí incluiremos los aspectos relevantes a la notación y el formato a lo largo del documento. Para simplificar podemos generar comandos nuevos que nos ayuden a ello, ver `comandos.sty` para más información.

Cuando nos refiramos a un programa en concreto, utilizaremos la notación:

emacs.

Cuando nos refiramos a un comando, o función de un lenguaje, usaremos la notación:

`quicksort`.

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Capítulo 1

Introducción

1.1. ¿Por qué un simulador de dominó?

A la hora de embarcarse en el desarrollo de un Proyecto Fin de Carrera, la primera duda es obvia: ¿Sobre qué va a versar mi proyecto?.

El Proyecto Fin de Carrera es el culmen a un largo período de aprendizaje, exámenes y vivencias y experiencias, y por estas razones la elección de una temática para el proyecto es compleja, ya que tenemos diferentes necesidades, limitaciones e impulsos:

1. Por una parte el proyecto es una facción más de nuestros estudios universitarios, que debemos solventar con éxito, y esta circunstancia nos puede llevar a buscar un proyecto más recortado o limitado en cuanto a requerimientos de tiempo y conocimiento.
2. Pero por otra parte nuestra faceta de ingenieros nos impulsa a aprender, a enfrentarnos con nuevos problemas y dificultades, a atacar ejercicios mentales duros e interesantes para hacer sudar nuestra mente.

Y después de tantear varios proyectos que tenía en mente, mis tutores me presentan la posibilidad de embarcarme en el desarrollo de un simulador de dominó. Al principio tomé la idea un poco en broma, ya que la temática en principio puede parecer poco tecnológica, demasiado localizada o con escaso atractivo, pero una vez analizado, el proyecto tenía todo lo que le podía pedir:

1. El apartado de Inteligencia Artificial es muy complejo, con lo cual se puede abordar de diferentes maneras, aplicando diferentes técnicas de sistemas expertos. Además es un problema de elevada complejidad computacional si intentamos resolverlo mediante simples árboles de decisión: como el juego se desarrolla dentro de un marco de conocimiento limitado (no conocemos las fichas de los demás jugadores) se produce una explosión combinatoria que nos obliga a buscar otros métodos y herramientas.
2. Por otro lado FIXME

1.2. Estructura de la memoria

Capítulo 2

Conceptos básicos

2.1. Conceptos básicos

2.1.1. El dominó

Historia del dominó

Reglas básicas

Estructura de una partida simple

El dominó es un juego de señores

Juego por parejas

Técnicas avanzadas

2.1.2. Inteligencia artificial

A la hora de afrontar un proyecto que simule cierto comportamiento *humano*, debemos acercarnos a esa rama de la Informática llamada Inteligencia Artificial, en busca de herramientas, técnicas y metodologías que nos ayuden a afrontar este difícil problema, probablemente uno de los más complicados dentro de la Ingeniería Ingormática

Sistemas expertos

Otros

Capítulo 3

Planificación

3.1. Planificación

Para el desarrollo de **Dominous** se decidió utilizar el modelo evolutivo iterativo incremental para el ciclo de vida del proyecto. La decisión fue tomada ya que, a pesar de tener acotado el ámbito y los requisitos del programa, la funcionalidad concreta de cada uno de los apartados se desconocía en un principio.

El modelo iterativo incremental es un modelo de tipo evolutivo que está basado en varios ciclos cascada realimentados aplicados repetidamente, con una filosofía iterativa. Como se comenta en CITE, al final de cada iteración se le realiza una entrega al cliente final; en este caso, el cliente ha sido el tutor del proyecto, que a cada iteración iba dictando las líneas maestras generales a tomar a cada nuevo paso.

Las ventajas de utilizar un modelo iterativo incremental son básicamente los siguientes:

1. Construir un sistema pequeño es siempre menos costoso en términos de riesgo.
2. Al ir desarrollando parte de las funcionalidades, es más fácil determinar si los requerimientos planeados para los niveles subsiguientes son correctos.
3. Si se comete algún error grave, sólo la última iteración necesita ser descartada.
4. Reduciendo el tiempo de desarrollo de un sistema (en este caso en incremento del sistema) decrecen las probabilidades que esos requerimientos de usuarios puedan cambiar durante el desarrollo.
5. Los errores de desarrollo realizados en un incremento, pueden ser arreglados antes del comienzo del próximo incremento.

El proyecto **Dominous** consta de tres subsistemas que son los que ocupan el grueso del desarrollo:

1. El primero es el motor de la partida: Controla los jugadores, las fichas en la mesa, la partida, situaciones irregulares y cualquier otro elemento referente únicamente al ámbito del dominó.
2. Por otro lado está el motor gráfico, que será la interfaz entre la partida y el usuario, permitiendo el movimiento fluído por las diferentes secciones del programa e interactuando de forma directa con el motor de la partida, mostrando las fichas actuales y habilitando la interacción del jugador con el mundo.
3. Y por último tenemos el motor de Inteligencia Artificial. Este motor será el que alimente la inteligencia y las acciones y decisiones de los jugadores controlados por el ordenador.

3.1.1. Incrementos realizados

A continuación se citan los diferentes incrementos que se han ido realizando en el desarrollo del proyecto.

Preliminares

El primer paso a la hora de enfrentarse a un proyecto es decidir las herramientas que vamos a utilizar. En principio se pensó utilizar el language C++ por dos sencillas razones:

1. Por un lado es un lenguaje que hemos aprendido en la carrera, se ha utilizado en varias asignaturas de diferentes ramas, con lo cual la comodidad y familiaridad que podemos tener a la hora de programar es un punto importante a tener en cuenta.
2. Tampoco podemos olvidar que, al ser un lenguaje compilado, la velocidad de ejecución que se consigue es interesante, y mucho más tratándose de temas como la inteligencia artificial (donde puede ser necesario un uso intensivo de los recursos del sistema) o el desarrollo de videojuegos (en el que la potencia del ordenador repercute en una mejor experiencia del usuario)

Capítulo 4

Análisis

4.1. Análisis

Capítulo 5

Diseño

5.1. Diseño

Capítulo 6

Implementación

6.1. Implementación

Capítulo 7

Pruebas

7.1. Pruebas

Capítulo 8

Conclusiones

8.1. Conclusiones

Capítulo 9

Apéndices

9.1. Apéndices

Bibliografía

- [1] Dimitri Van Heesch. Pagina oficial de Doxygen. <http://www.doxygen.org>.
- [2] Gerardo Aburruzaga García. Make. Un programa para controlar la recompilación. <http://www.uca.es/softwarelibre/publicaciones/make.pdf>.

Software utilizado

Es usual en un PFC referenciar que software has usado para la realización del mismo. Aprovecharé este apartado para que conozcas alguna herramienta que puede serte de ayuda para realizar tus documentos en \LaTeX

Emacs + AucTeX

Emacs es uno de los programas de edición más usados por desarrolladores de software, ya que es bastante versátil admitiendo gran cantidad de “plugins” o extensiones que permiten ampliar aun más sus funcionalidades.

Uno de estos plugins es AucTeX[?], el cual incluye rutas para ciertos comandos, resaltado de sintaxis, previsualización del documento, menú matemático en el cual podemos acceder e insertar la gran mayoría de los símbolos matemáticos, para no tener que memorizarlos. Podemos ver un ejemplo de Emacs + AucTeX en la figura 9.1

Por ejemplo, para cerrar un entorno `\begin()`, con su respectivo `\end()`, utilizaremos el atajo `C-c M-]`, para añadir un `\item`, tenemos el atajo `C-c C-j`, y así unos cuantos, que una vez que nos habituamos a ellos, son bastante cómodos.

Además, es bastante configurable, con indentado automático, corrector ortográfico y demás. El fichero adjunto a este documento, *conf_emacs* incluye una configuración con varias de estas opciones.

Doxygen

Realmente, *Doxygen* [1] no es una herramienta que vayamos a utilizar para realizar documentos \LaTeX directamente. Sin embargo, para la documentación de código si es bastante útil.

Esta herramienta realiza una documentación automática de código fuente. Es decir, para nuestro PFC, podemos utilizar para generar la documentación de las APIs de nuestras librerías y demás. Puede generar esta documentación en varios formatos, y entre ellos, \LaTeX , de forma que podemos utilizar ese código generado en nuestra memoria de forma automática.

GNU Make

GNU Make es el programa de recompilación y de control de dependencias por excelencia. Se puede utilizar para compilar proyectos software en diversos códigos, o como en el caso de este documento, para compilar documentos \LaTeX con diversas opciones.

Para más información [2]

Dia

Dia es un editor de gráficos vectoriales el cual incluye distintas plantillas para distintos tipos de gráficos, como pueden ser UML, ERe, diagramas de flujo, esquemas Cisco de red y un larguísimo etcétera. Podemos ver el interfaz en la figura [9.2](#)

Estos diagramas podemos exportarlos a diversos formatos de imagen (.png, .eps, ...) o a formato .tex, como vimos anteriormente.

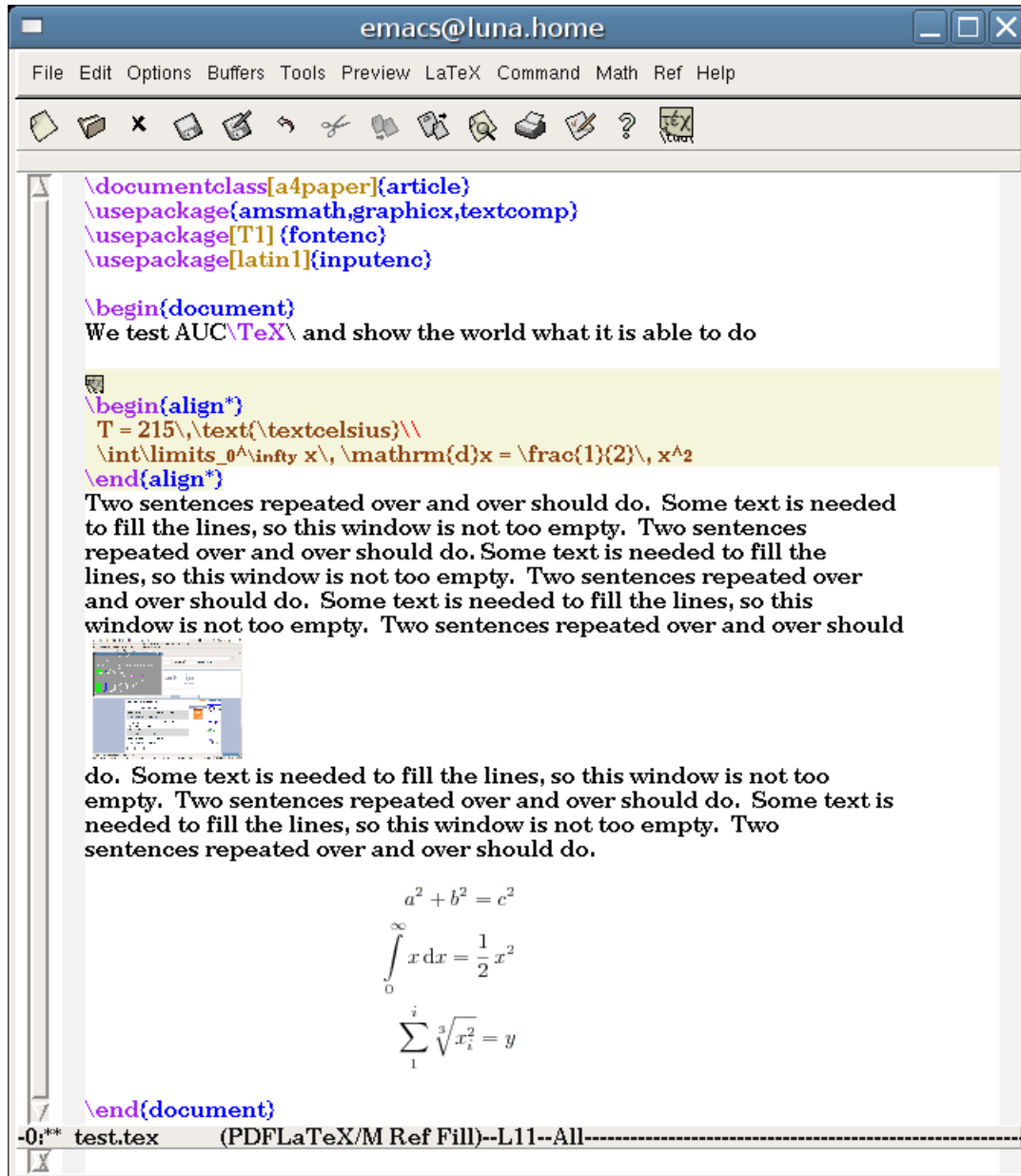


Figura 9.1: Emacs + Auc \TeX

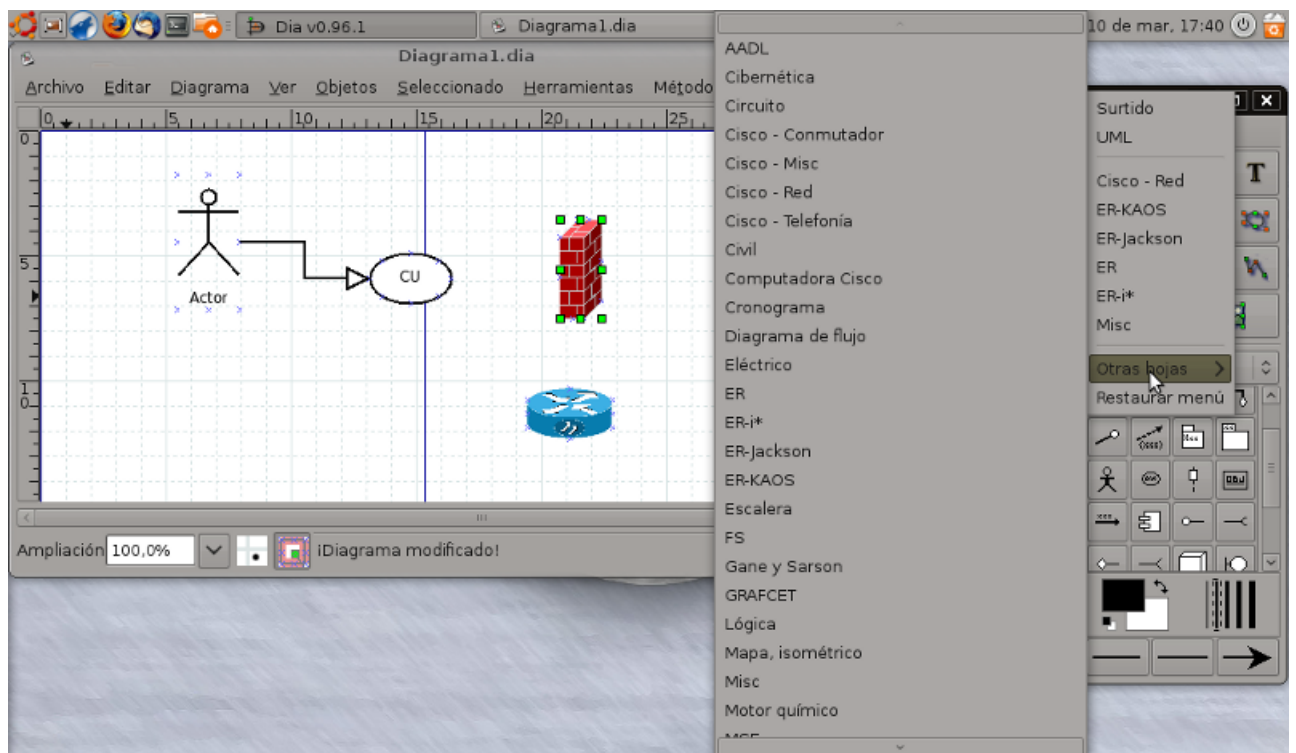


Figura 9.2: Interfaz de Dia

Instalación de L^AT_EX

Veamos que tenemos que hacer para instalar L^AT_EX con todas sus capacidades en un sistema basado en Debian, como Ubuntu. Primero hay que tener en cuenta que L^AT_EX es relativamente pesado con respecto a otros compiladores.

Nosotros vamos a utilizar la distribución de L^AT_EX incluida en los repositorios de Ubuntu llamada *texlive*. Si la buscas en tu gestor de paquetes, encontrarás infinidad de paquetes aparte del principal. Existen otras distribuciones como Te_X

Si instalas solo los básicos, es decir instalas *texlive* y los programas necesarios para él, no podrás compilar este documento, ya que faltarían paquetes tales como *supertabular* y varios. Por eso, si no tienes problema de espacio en el disco duro te recomiendo que instales el paquete *texlive-full*, que instala **todos** los paquetes de *texlive*, incluyendo documentación en todos los idiomas disponibles. Si buscas no tener problemas de dependencias, este es tu método.

```
sudo apt-get install texlive-full
```

En caso de querer ser un poco más concreto, en principio puedes trabajar con la más básica (*texlive* y sus dependencias) y en función de los paquetes que te vayan faltando, los instalas.

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