

Executable Texts

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Changing Perspectives on Software

- ◆ Usual view
 - Software running end product
 - ◆ e.g., Microsoft Word or PowerPoint
- ◆ Alternative view
 - Software as document, manuscript, corpus, or text
 - Consumed among communities of programmers
 - Continual historical archive, written and re-written
 - ◆ Programmer acts like “Talmudic” scholar
- ◆ Method
 - Comparing comments by two sub-communities
 - ◆ Linux Open Source Programmers working on the operating system kernel in C
 - ◆ Corporate programmers working on a core business application in COBOL

Some Patterns Emerge

- ◆ “Real” constraints
 - The artifacts are impacted by practical considerations outside of the programming task
- ◆ Social roles of executable texts
 - What the common laborer is doing, rather than those in charge
 - ◆ The lives and intentions of actual people are encapsulated in the comments
 - Even when created for “capitalist” ends, the personalities of the programmers show through
- ◆ “Programming archaeology” / Micro-histories
 - A single program is a form of virtual archaeology, peeling back the layers of modifications by various people for various projects

Linguistic Requirements

- ◆ How to define a comment...
 - in COBOL (corporate program)

```
00892 *----SET ADDRESS OF MESSAGE MAIN HEADER. PRGMNBR1
00893 * PRGMNBR1
```

- in C++ (online programming guide)

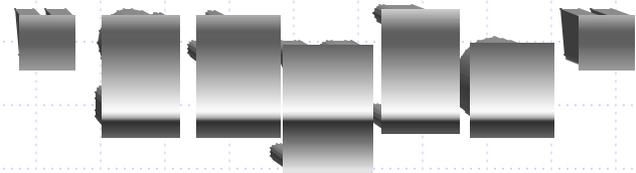
```
//=====//
//Development By : Jigar Mehta
//Date : [ & now() & ]
//=====//
```

- in C (Linux kernel)

```
/* Arch-specific enabling code. */
```


Cultural Constraints and Norms

- ◆ Accepted practices
 - Normative purpose for the comment
 - ◆ Power structure driving the norms
 - Content
 - Visual Impact



Purpose:
Identify “who”
& “when”

Power:
Developed by a
manager

Content:
Nothing about
the code

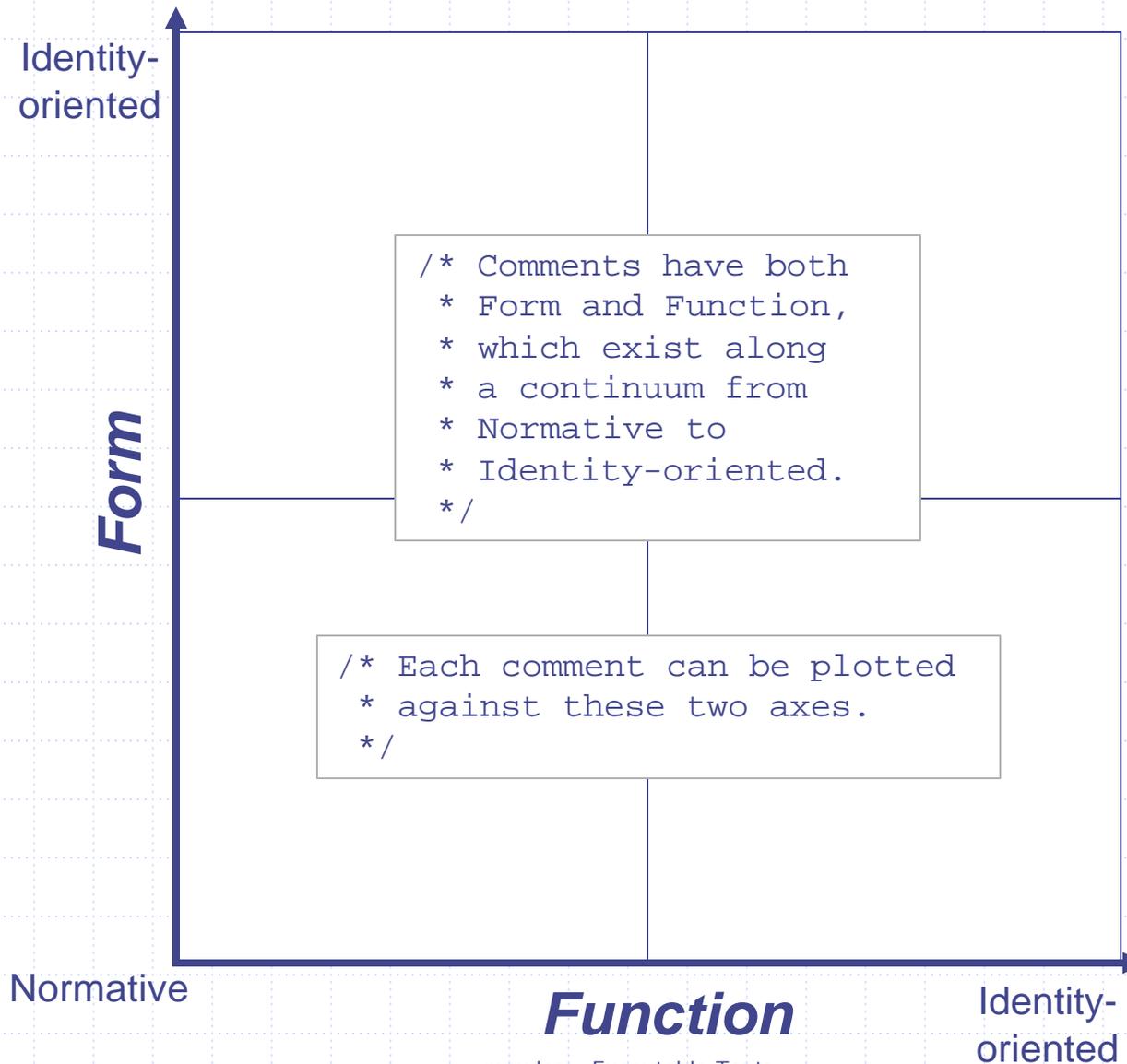
Visual:
Easy to see
when scanning

```
//=====//  
//Development By : Jigar Mehta  
//Date : [ & now() & ]  
//=====//
```

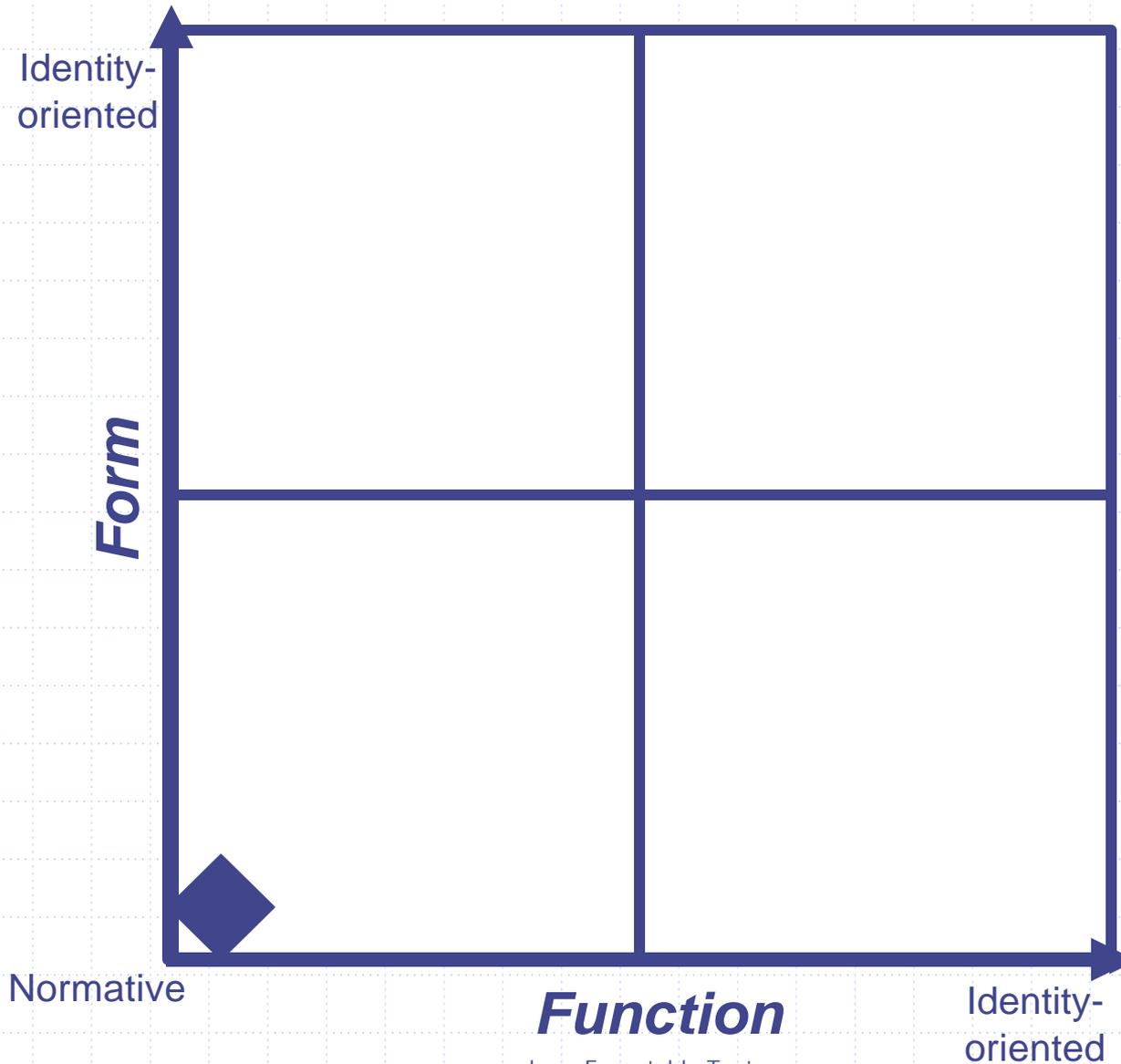
```
/* Arch-specific enabling code. */ (cpu.c)
```

```
#endif /*CONFIG_HOTPLUG_CPU*/ (cpu.c)
```

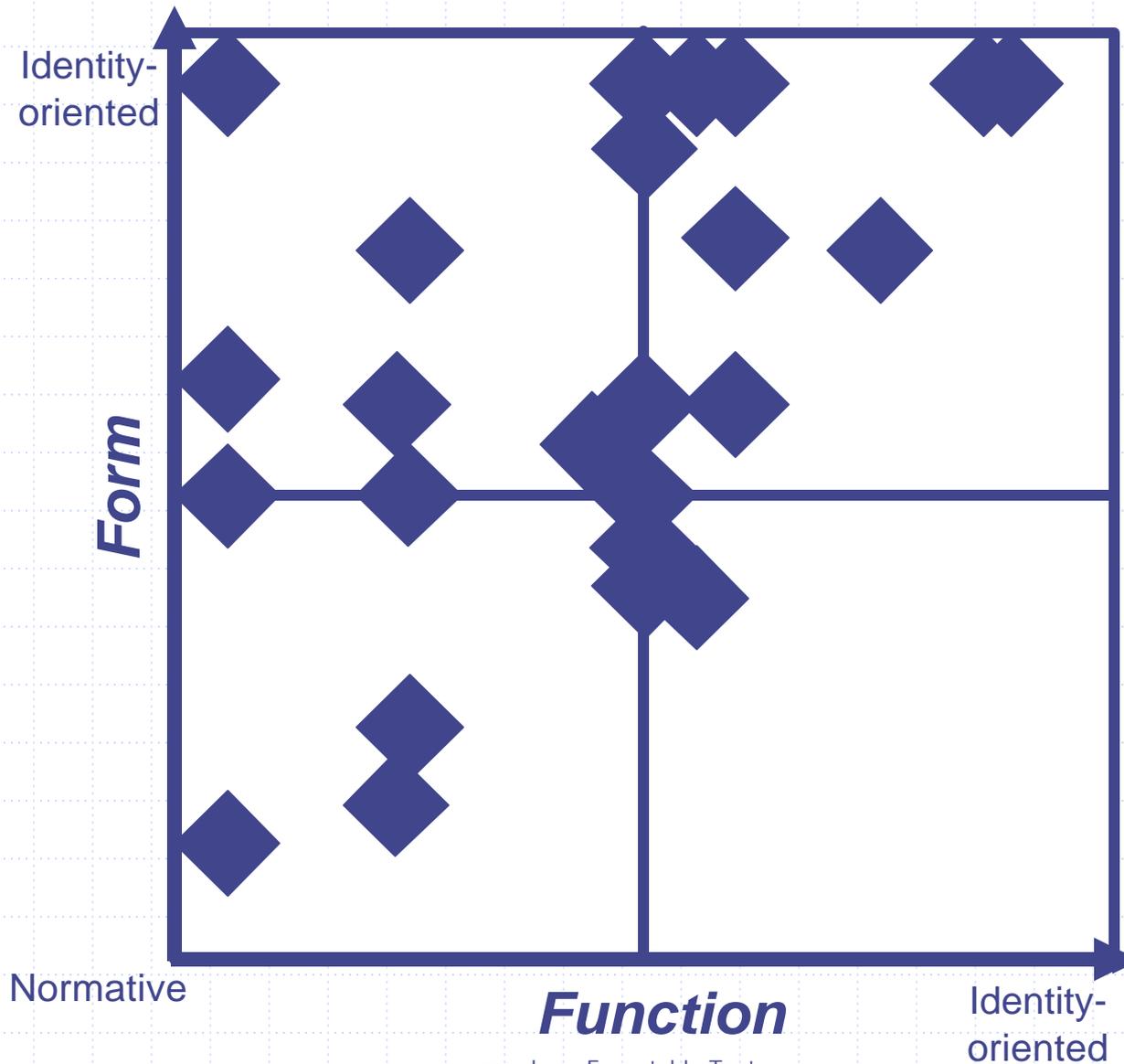
Mapping Code Comments



"Good" Comments



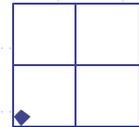
Identity-oriented Comments



Good Comments – One Example

◆ Corporate Sample

```
01827 *PSR3
01828 *      WHEN SUB PROMO IS PASSED, SET UP PGM TO UPDATE FF INFO IF
01829 *      SUBSEQUENT EDITS ARE COMPLETED ERROR FREE
01830 *      LOGIC TO UPDATE WAS PREVIOUS LOCATED HERE
01831 *      IT HAS BEEN MOVED TO THE 0840 PARAGRAPH
01832 *
```

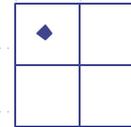


- Written in COBOL
- Tells what is happening
- What has been changed
- How it was changed
- Does not tell “who” or “when”
- Does say “why”, subtly with “PSR3”
 - ◆ Shows much context, if you know the context...
- Just one of many forms a “good” comment may take

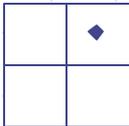
The Texts Speak for Themselves...

- ◆ Letting individual personality come through

```
/*  
 * Select whether the frequency is to be controlled  
 * and in which mode (PLL or FLL). Clamp to the operating  
 * range. Ugly multiply/divide should be replaced someday.  
 */(time.c)
```



- ◆ Allowing comments to act as a “dialog”

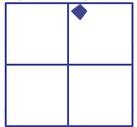


```
if (IS_ERR(p)) { /* Should never happen since we send PATH_MAX */  
    /* FIXME: can we save some information here? */  
    audit_log_format(ab, "<too long>");  
} else  
    audit_log_untrustedstring(ab, p);  
kfree(path);  
}(acct.c)
```

The Texts Speak for Themselves...

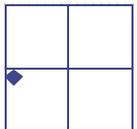
- ◆ Judging the programming history around one's edit

```
06073 * THAT CONCLUDES THE STRUCTURED COBOL PORTION OF THIS PGM...
06074 * RETURN TO SPAGHETTI CODE!
06075      GO TO 3159-CONTINUE-SPAGHETTI.
```



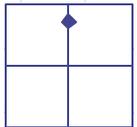
- ◆ Individualism in a limited medium

```
00404 *RTR 8/22/94 \/  
00405      05 WS-TRAN-CODE                      PIC X(02).  
00406 *RTR 8/22/94 /\
```



- ◆ Taking shots at other programmers

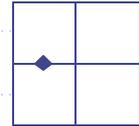
```
02266 * 06/17/96 name      06/26/96      FIXED FOR PRT#960521.05.  
[... 5 lines removed ...]  
02272 *  
02273 *      ALSO REMOVED THE CODE THAT  
02274 *      APPEARED TO BE A RESULT OF A  
02275 *      PROGRAMMER GUESSING HOW COBOL  
02276 *      WORKED.  THESE GUESSES CAUSED  
02277 *      WARNINGS WHEN COMPILED,  
02278 *      ADDED UNECESSARY OVERHEAD AND  
02279 *      COMPLEXITY TO THE PROGRAM, AND  
02280 *      OBSCURED THE LOGIC OF THE PGM.
```



“We”: Elevating the Discipline

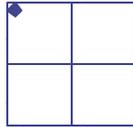
- ◆ The “academic” lecture

```
/*  
 * If we're in an interrupt or softirq, we're done  
 * (this also catches softirq-disabled code). We will  
 * actually run the softirq once we return from  
 * the irq or softirq.  
 *  
 * Otherwise we wake up ksoftirqd to make sure we  
 * schedule the softirq soon.  
 */(softirq.c)
```



"We": Enforcing Boundaries

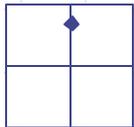
◆ Boundaries with users



```
/* We only trust the superuser with rebooting the system. */
if (!capable(CAP_SYS_BOOT))
    return -EPERM;

/* For safety, we require "magic" arguments. */
if (magic1 != LINUX_REBOOT_MAGIC1 ||
    (magic2 != LINUX_REBOOT_MAGIC2 &&
     magic2 != LINUX_REBOOT_MAGIC2A &&
     magic2 != LINUX_REBOOT_MAGIC2B &&
     magic2 != LINUX_REBOOT_MAGIC2C))
    return -EINVAL;(sys.c)
```

◆ With outsiders

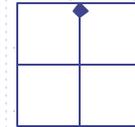


```
/*
 * setuid() is implemented like SysV with SAVED_IDS
 *
 * Note that SAVED_ID's is deficient in that a setuid root program
 * like sendmail, for example, cannot set its uid to be a normal
 * user and then switch back, because if you're root, setuid() sets
 * the saved uid too. If you don't like this, blame the bright people
 * in the POSIX committee and/or USG. Note that the BSD-style setreuid()
 * will allow a root program to temporarily drop privileges and be able to
 * regain them by swapping the real and effective uid.
 */(sys.c)
```

"We": Linking Programmer & System

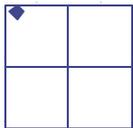
◆ First: Anthropomorphize the System

```
/* Some compilers disobey section attribute on statics when not
   initialized -- RR */(softirq.c)
```



◆ Then becoming part of the system is "natural"...

```
/*
 * We're trying to get all the cpus to the average_load, so we don't
 * want to push ourselves above the average load, nor do we wish to
 * reduce the max loaded cpu below the average load, as either of these
 * actions would just result in more rebalancing later, and ping-pong
 * tasks around. Thus we look for the minimum possible imbalance.
 * Negative imbalances (*we* are more loaded than anyone else) will
 * be counted as no imbalance for these purposes -- we can't fix that
 * by pulling tasks to us. Be careful of negative numbers as they'll
 * appear as very large values with unsigned longs.
 */(sched.c)
```



Samples Compared

	<i>Linux kernel:</i>	<i>Corporate sample:</i>
Total Files	52	7
Total Lines	41,505	28,304
Lines with Comments	5711	6294
Percentage of Comments to Total Lines	13.75%	22.24%
Lines with “we” Construction	738	36
Percentage of Total Lines with “we”	1.78%	0.13%
Percentage of Comment Lines with “we”	12.92%	0.57%

Identities and Knowledge

- ◆ Comments are both normative & identity-oriented
 - Structure (form & function)

	<i>Linux kernel</i>	<i>Corporate sample</i>
Programmer Community	Collegial; Cooperative; Collective	Hierarchical; Judgmental
Association with the Machine	High	"just a job"
Sense of Self	Closely tied to Program	"just a job"

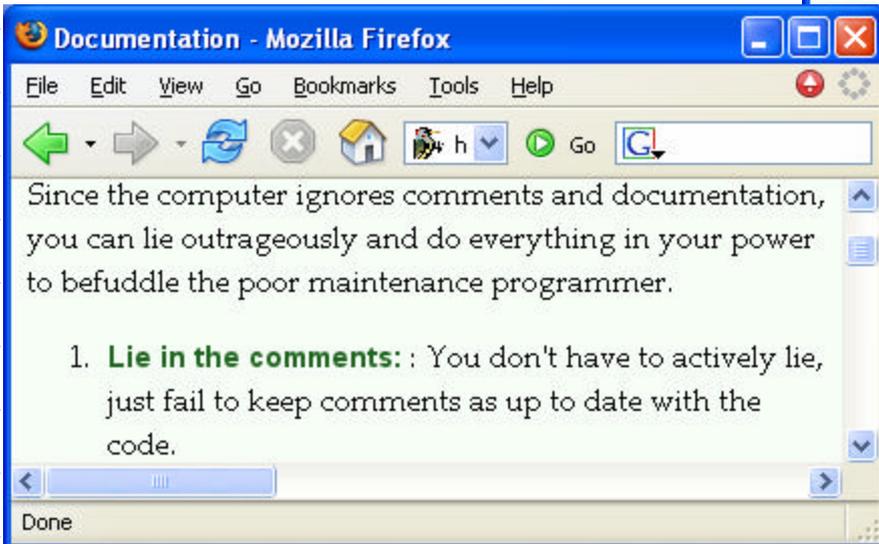
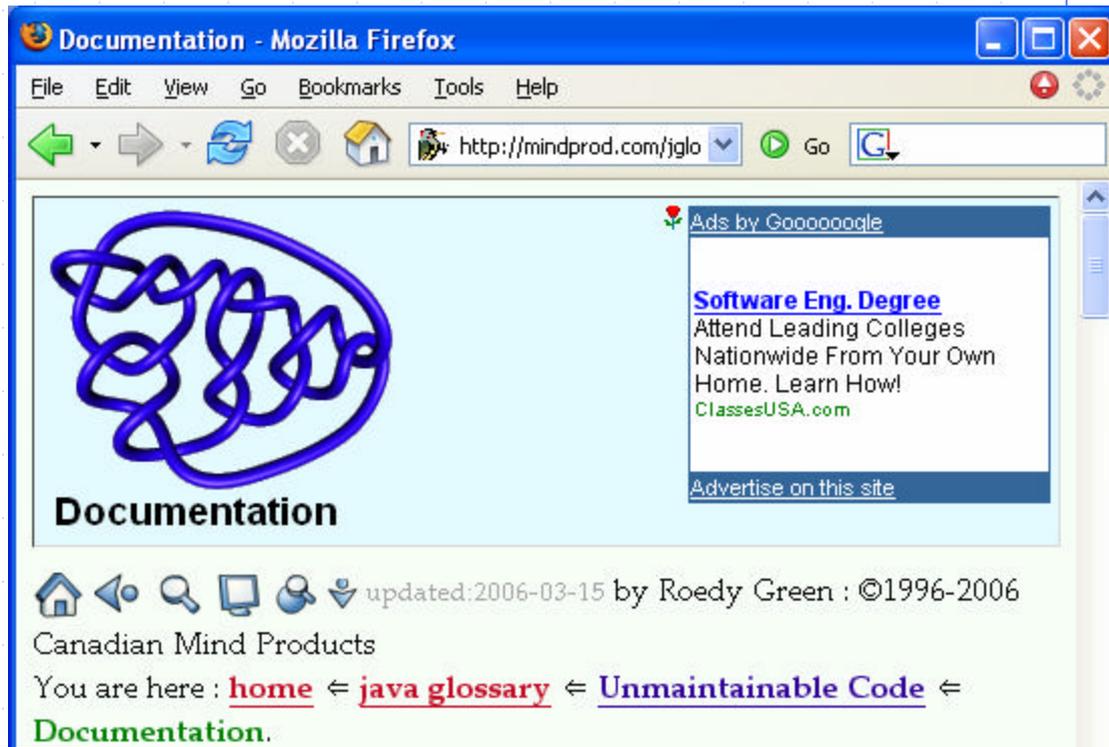
- ◆ Commenting is a critical element of
 - Group / Community identity
 - Personal identity (it is "performative")
 - Historical continuity (both "project" and "community")

Making it Relevant

- ◆ Pragmatic / business implications
 - “There is only one accurate form of system documentation: the source code” – anonymous developer
 - ◆ The conventional wisdom may be applicable to organizational factors and the source code (including comments)
 - Window into group dynamics
 - Potentially a chart of organizational health
- ◆ Research
 - Valuable and largely untapped research archive
 - Apply the above conventional wisdom to a host of factors
 - ◆ Add more time dimensions
 - Program and comment change over time
 - Changes in style, tone, and cultural references
 - ◆ Add more samples

A Note of Caution!

- ◆ How to Write Unmaintainable Code
 - Counter-normative
 - Shows how comments “should” be written



“Any fool can tell the truth, but it requires a man of some sense to know how to lie well.”

~ **Samuel Butler (1835 - 1902)**

“Incorrect documentation is often worse than no documentation.”

~ **Bertrand Meyer**

A Contrary View

- ◆ Does the “We” Construction really indicate collegiality?
 - The Commentator – a satirical faux comment generator

