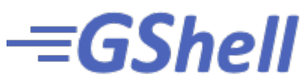
2020年8月16日 投稿者: SATOXITS

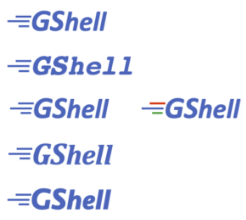
続GShell / 0.1.1 ー ロゴの検討

広報：それでご依頼のGShellのロゴですが、第ゼロ次案としてこのようなものを考えてみました。



社長：いい感じですが、Sがもうちょとふくよかな感じが良いです。

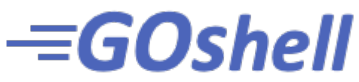
広報：それがなかなか、そのようなフォントがないんですよね… macOS版のパワポではうんざりするほどロゴがあって、その中で30くらいは探したのですが…



社長：やはりCourier は良いですが、エルがちょっとうざいというか、間延び感がどうもですね。

開発：わたしはエルエルの ll が斜体で // みたいに見えるのが好きですね。実は、// というシンボルは、ゆるい順序関係もありパイプライン的な連結関係を表すのに良い記号だと思っていまして、何かに使いたいと思っているのです。

基盤：ところで名前はいっそ*GOshell* にするとか？略してgosh。



開発：まあ、最終的には必ずしもGoにべったりを目指しているわけではありませんので…　Gは general みたいなつもりでいたいと思っています。

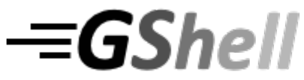
社長：そういう意味では Unified とか Universal の U も好きですね。

開発：ush。母音字がから始まるところがどうかなとは思いますね。

基盤：では bush とか push とか zush とか:-)

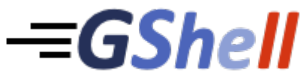
社長：まあ当面は gsh で行きますか。

広報：グレースケールでグラデーションという案も考えてみました。



社長：悪くないと思いますが…　これでもPNGで5KBあるんですね。

広報：ちょっとおフランス系とか。



開発：多色だとインパクトはありますね。

基盤：でも、Gまでがパクリだとすると、Gの部分は Goブルーのほうが良いのでは。

広報：ではGは青で、後はおとなしめに案。

広報：あるいはもう、いっそミキハウス案。

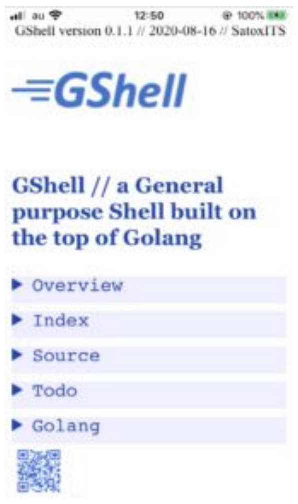
社長：うーん、とりあえずおとなしめのLogo005.pngで行きましょう。すみれ色が好きだし。

＊　＊　＊

開発：ロゴをソースコードに張り込んでみました。

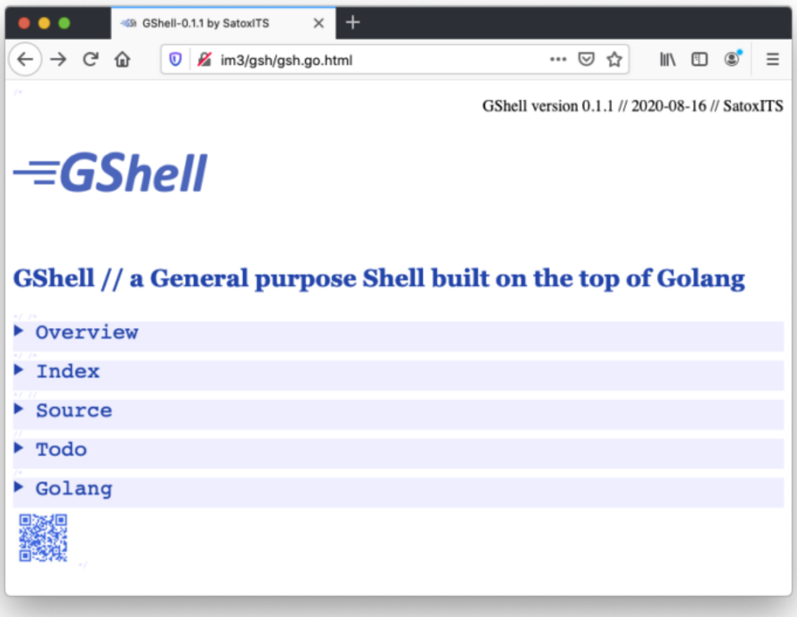
基盤：ソースコードに？

開発：gsh.go は、ソースコード兼、ホームページ兼、ドキュメント兼、…です。Go言語に従っていますが、HTMLでもあります。拡張子を変えると見え方が変わります。たとえばスマホで見るとこう。


GShell version 0.1.1 // 2020-08-16 // SatoxITS

GShell // a General purpose Shell built on the top of Golang

開発：デスクトップで見るとこうです。



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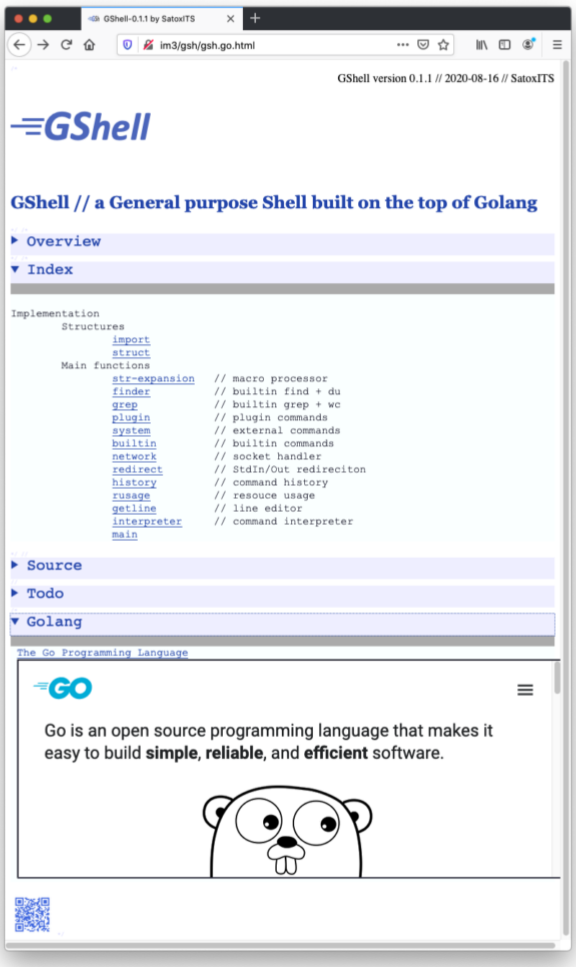
社長：ロゴは単色の第ゼロ次案なんですね。

開発：現在のページ構成の中では収まりが良いかと。とりあえずです。



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GShell // a General purpose Shell built on the top of Golang

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        Structures
                import
                struct
        Main functions
                str-expansion   // macro processor
                finder          // builtin find + du
                grep            // builtin grep + wc
                plugin          // plugin commands
                system          // external commands
                builtin         // builtin commands
                network         // socket handler
                redirect        // StdIn/Out redireciton
                history         // command history
                rusage          // resouce usage
                getline         // line editor
                interpreter     // command interpreter
                main
```

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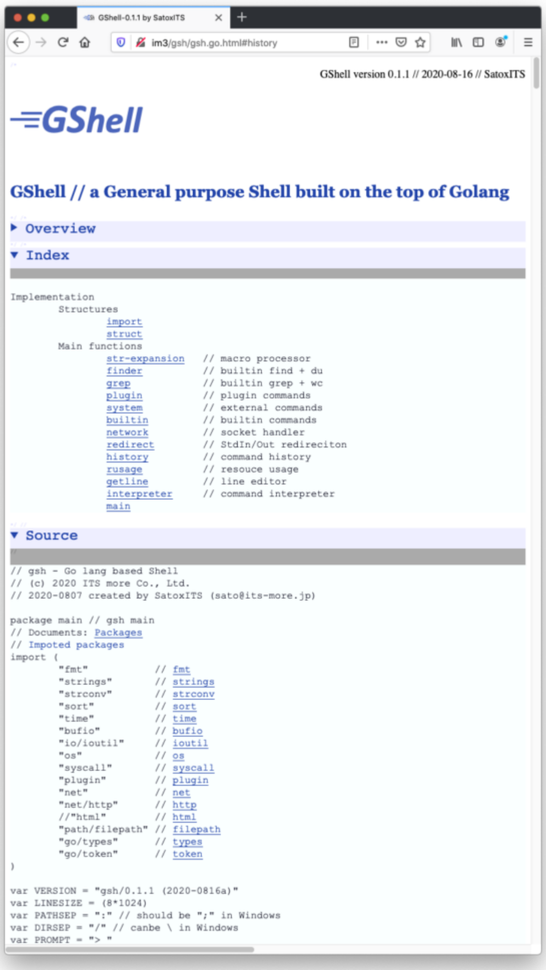
The Go Programming Language

Go is an open source programming language that makes it easy to build **simple**, **reliable**, and **efficient** software.

開発：インデックスでソースコードの各部にジャンプする仕掛けですが、これは自分でもコードをブラウズするのにも便利しています。 参照しているパッケージにも即飛べます。ソースプロラムも能動的にハイパーテキストであるべきだと思います。アクティブソースコードとでも言いましょうか。


GShell-0.1.1 by SatoxITS

im3/gsh/gsh.go.html#history

GShell version 0.1.1 // 2020-08-16 // SatoxITS

GShell // a General purpose Shell built on the top of Golang

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                interpreter     // command interpreter
                main
```

▾ Source

```
// gsh - Go lang based Shell
// (c) 2020 ITS more Co., Ltd.
// 2020-0807 created by SatoxITS (sato@its-more.jp)

package main // gsh main
// Documents: Packages
// Impoted packages
import (
        "fmt"           // fmt
        "strings"       // strings
        "strconv"       // strconv
        "sort"          // sort
        "time"          // time
        "bufio"         // bufio
        "io/ioutil"     // ioutil
        "os"            // os
        "syscall"       // syscall
        "plugin"        // plugin
        "net"           // net
        "net/http"      // http
        //"html"        // html
        "path/filepath" // filepath
        "go/types"      // types
        "go/token"      // token
)

var VERSION = "gsh/0.1.1 (2020-0816a)"
var LINESIZE = (8*1024)
var PATHSEP = ":" // should be ";" in Windows
var DIRSEP = "/" // canbe \ in Windows
var PROMPT = "> "
```

社長：Wikiを編集するようにしてプログラムが書けると良いのかも知れませせねん。わたし的にはPDFにして署名するのが楽で良いです(^-^)

開発：WordPressにも拡張HTMLとして貼り付けられると良いのですが…　ああそうか、HTMLのソースを表示して全選択してカスタムHTMLに貼り付ければよいのですね。ただ…　CSSにスコープが無いから本文のスタイルまで変わっちゃうと言うw

社長：iframe に閉じ込められれば良いと思うのですが。インラインのテキストをiframeのコンテンツにする方法ってあるんですかね。textarea 的に。

開発：迫害されて消されてしまったframeでは出来たと思うんですが…

社長：data URI にするほど小さくも無いですしねｗ

開発：要は「id を付けた要素をここに展開する」という機能があれば良いのですが。iframe でなくてもなんでも、というか iframe 以外のほうが便利ですが。

開発：ともかくこの、CSSのスコープというかセレクタというのがどうもわからない。まとめて各方法というか {} が入れ子にできないのかわからなので、ベタに書いてみました。これで何とか。

社長：うんうん。よろしいんじゃないでしょうか。ではこれを印刷して終了したいと思います。

— 2020-0816 SatoxITS

// /*

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*/ //

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//

```
// gsh - Go lang based Shell
// (c) 2020 ITS more Co., Ltd.
// 2020-0807 created by SatoxITS (sato@its-more.jp)

package main // gsh main
// Documents: Packages
// Impoted packages
import (
        "fmt"           // fmt
```

```
	"strings"       // strings
	"strconv"       // strconv
	"sort"          // sort
	"time"          // time
	"bufio"         // bufio
	"io/ioutil"     // ioutil
	"os"            // os
	"syscall"       // syscall
	"plugin"        // plugin
	"net"           // net
	"net/http"      // http
	//"html"        // html
	"path/filepath" // filepath
	"go/types"      // types
	"go/token"      // token
)

var VERSION = "gsh/0.1.1 (2020-0816a)"
var LINESIZE = (8*1024)
var PATHSEP = ":" // should be ";" in Windows
var DIRSEP = "/" // canbe \ in Windows
var PROMPT = "> "
var GSH_HOME = ".gsh" // under home directory

// -xX logging control
// --A-- all
// --I-- info.
// --D-- debug
// --W-- warning
// --E-- error
// --F-- fatal error

// Structures
type GCommandHistory struct {
	StartAt         time.Time // command line execution started at
	EndAt           time.Time // command line execution ended at
	ResCode         int       // exit code of (external command)
	CmdError        error     // error string
	OutData         *os.File  // output of the command
	FoundFile       []string  // output - result of ufind
	Rusagev         [2]syscall.Rusage // Resource consumption, CPU time or so
	CmdId           int       // maybe with identified with arguments or impact
	                          // redireciton commands should not be the CmdId
	WorkDir         string    // working directory at start
	CmdLine         string    // command line
}
type GChdirHistory struct {
	Dir             string
	MovedAt         time.Time
}
type CmdMode struct {
	BackGround      bool
}
type PluginInfo struct {
	Spec            *plugin.Plugin
	Addr            plugin.Symbol
	Name            string // maybe relative
	Path		string // this is in Plugin but hidden
}
type GshContext struct {
	StartDir	string	// the current directory at the start
	GetLine		string	// gsh-getline command as a input line editor
	ChdirHistory	[]GChdirHistory // the 1st entry is wd at the start
	gshPA		syscall.ProcAttr
	CommandHistory	[]GCommandHistory
	CmdCurrent	GCommandHistory
	BackGround	bool
	BackGroundJobs	[]int
	LastRusage	syscall.Rusage
	GshHomeDir	string
	TerminalId	int
	CmdTrace	bool
	PluginFuncs	[]PluginInfo
}

func strBegins(str, pat string)(bool){
	if 0 < len(str){
		yes := str[0:len(pat)] == pat
		//fmt.Printf("--D-- strBegins(%v,%v)=%v\n",str,pat,yes)
		return yes
	}
	//fmt.Printf("--D-- strBegins(%v,%v)=%v\n",str,pat,false)
	return false
}
func isin(what string, list []string) bool {
	for _, v := range list  {
		if v == what {
			return true
		}
	}
	return false
}
func isinX(what string,list[]string)(int){
	for i,v := range list {
		if v == what {
			return i
		}
	}
	return -1
}

func env(opts []string) {
	env := os.Environ()
	if isin("-s", opts){
		sort.Slice(env, func(i,j int) bool {
			return env[i] < env[j]
		})
	}
	for _, v := range env {
		fmt.Printf("%v\n",v)
	}
}

// - rewriting should be context dependent
// - should postpone until the real point of evaluation
// - should rewrite only known notation of symobl
func scanInt(str string)(val int,leng int){
	leng = -1
	for i,ch := range str {
		if '0' <= ch && ch <= '9' {
			leng = i+1
		}else{
			break
		}
	}
	if 0 < leng {
		ival,_ := strconv.Atoi(str[0:leng])
		return ival,leng
	}else{
		return 0,0
	}
}
func substHistory(gshCtx *GshContext,str string,i int,rstr string)(leng int,rst string){
	if len(str[i+1:]) == 0 {
		return 0,rstr
	}
	hi := 0
	histlen := len(gshCtx.CommandHistory)
	if str[i+1] == '!' {
		hi = histlen - 1
		leng = 1
	}else{
		hi,leng = scanInt(str[i+1:])
		if leng == 0 {
			return 0,rstr
		}
		if hi < 0 {
			hi = histlen + hi
		}
	}
	if 0 <= hi && hi < histlen {
		//fmt.Printf("--D-- %v(%c)\n",str[i+leng:],str[i+leng])
		if 1 < len(str[i+leng:]) && str[i+leng:][1] == 'f' {
			leng += 1
			xlist := []string{}
			list := gshCtx.CommandHistory[hi].FoundFile
			for _,v := range list {
				//list[i] = escapeWhiteSP(v)
				xlist = append(xlist,escapeWhiteSP(v))
			}
			//rstr += strings.Join(list," ")
			rstr += strings.Join(xlist," ")
		}else{
			rstr += gshCtx.CommandHistory[hi].CmdLine
		}
	}else{
		leng = 0
	}
	return leng,rstr
}
func escapeWhiteSP(str string)(string){
        if len(str) == 0 {
                return "\\z" // empty, to be ignored
        }
        rstr := ""
        for _,ch := range str {
                switch ch {
                        case '\\': rstr += "\\\\"
                        case ' ': rstr += "\\s"
                        case '\t': rstr += "\\t"
                        case '\r': rstr += "\\r"
                        case '\n': rstr += "\\n"
                        default: rstr += string(ch)
                }
        }
        return rstr
}
func unescapeWhiteSP(str string)(string){ // strip original escapes
        rstr := ""
        for i := 0; i < len(str); i++ {
                ch := str[i]
                if ch == '\\' {
                        if i+1 < len(str) {
                                switch str[i+1] {
                                        case 'z':
                                                continue;
                                }
                        }
                }
                rstr += string(ch)
        }
        return rstr
}
func unescapeWhiteSPV(strv []string)([]string){ // strip original escapes
        ustrv := []string{}
        for _,v := range strv {
                ustrv = append(ustrv,unescapeWhiteSP(v))
        }
        return ustrv
}

// str-expansion
// - this should be a macro processor
func strsubst(gshCtx *GshContext,str string,histonly bool) string {
        rstr := ""
        inEsc := 0 // escape characer mode
        for i := 0; i < len(str); i++ {
                //fmt.Printf("--D--Subst %v:%v\n",i,str[i:])
                ch := str[i]
                if inEsc == 0 {
                        if ch == '!' {
                                leng,xrstr := substHistory(gshCtx,str,i,rstr)
                                if 0 < leng {
                                        i += leng
                                        rstr = xrstr
                                        continue
                                }
                        }
                        switch ch {
                                case '\\': inEsc = '\\'; continue
                                case '%':  inEsc = '%';  continue
                                case '$':
                        }
                }
                switch inEsc {
                case '\\':
                        switch ch {
                                case '\\': ch = '\\'
                                case 's': ch = ' '
                                case 't': ch = '\t'
                                case 'r': ch = '\r'
                                case 'n': ch = '\n'
                                case 'z': inEsc = 0; continue // empty, to be ignored
                        }
                        inEsc = 0
                case '%':
                        switch {
                                case ch == '%': ch = '%'
                                case ch == 'T':
                                        rstr = rstr + time.Now().Format(time.Stamp)
                                        continue;
                                default:
                                        // postpone the interpretation
                                        rstr = rstr + "%" + string(ch)
                                        continue;
                        }
                        inEsc = 0
                }
                rstr = rstr + string(ch)
        }
        return rstr
}
func showFileInfo(path string, opts []string) {
        if isin("-l",opts) || isin("-ls",opts) {
                fi, _ := os.Stat(path)
                mod := fi.ModTime()
                date := mod.Format(time.Stamp)
                fmt.Printf("%v %8v %s ",fi.Mode(),fi.Size(),date)
        }
        fmt.Printf("%s",path)
        if isin("-sp",opts) {
                fmt.Printf(" ")
        }else
        if ! isin("-n",opts) {
                fmt.Printf("\n")
        }
}
func userHomeDir()(string,bool){
        /*
        homedir,_ = os.UserHomeDir() // not implemented in older Golang
        */
        homedir,found := os.LookupEnv("HOME")
        //fmt.Printf("--I-- HOME=%v(%v)\n",homedir,found)
        if !found {
                return "/tmp",found
```

```
	}
	return homedir,found
}

func toFullpath(path string) (fullpath string) {
	if path[0] == '/' {
		return path
	}
	pathv := strings.Split(path,DIRSEP)
	switch {
	case pathv[0] == ".":
		pathv[0], _ = os.Getwd()
	case pathv[0] == "..": // all ones should be interpreted
		cwd, _ := os.Getwd()
		ppathv := strings.Split(cwd,DIRSEP)
		pathv[0] = strings.Join(ppathv,DIRSEP)
	case pathv[0] == "~":
		pathv[0],_ = userHomeDir()
	default:
		cwd, _ := os.Getwd()
		pathv[0] = cwd + DIRSEP + pathv[0]
	}
	return strings.Join(pathv,DIRSEP)
}

func IsRegFile(path string)(bool){
	fi, err := os.Stat(path)
	if err == nil {
		fm := fi.Mode()
		return fm.IsRegular();
	}
	return false
}

// grep
// "lines", "lin" or "lnp" for "(text) line processor" or "scanner"
// a*,!ab,c, ... sequentioal combination of patterns
// what "LINE" is should be definable
// generic line-by-line processing
// grep [-v]
// cat -n -v
// uniq [-c]
// tail -f
// sed s/x/y/ or awk
// grep with line count like wc
// rewrite contents if specified
func xGrep(gshCtx GshContext,path string,rexpv[]string)(int){
	file, err := os.OpenFile(path,os.O_RDONLY,0)
	if err != nil {
		fmt.Printf("--E-- grep %v (%v)\n",path,err)
		return -1
	}
	defer file.Close()
	if gshCtx.CmdTrace { fmt.Printf("--I-- grep %v %v\n",path,rexpv) }
	//reader := bufio.NewReaderSize(file,LINESIZE)
	reader := bufio.NewReaderSize(file,80)
	li := 0
	found := 0
	for li = 0; ; li++ {
		line, err := reader.ReadString('\n')
		if len(line) <= 0 {
			break
		}
		if 150 < len(line) {
			// maybe binary
			break;
		}
		if err != nil {
			break
		}
		if 0 <= strings.Index(string(line),rexpv[0]) {
			found += 1
			fmt.Printf("%s:%d: %s",path,li,line)
		}
	}
		//fmt.Printf("total %d lines %s\n",li,path)
	//if( 0 < found ){ fmt.Printf("((found %d lines %s))\n",found,path); }
	return found
}

// Finder
// finding files with it name and contents
// file names are ORed
// show the content with %x fmt list
// ls -R
// tar command by adding output
type fileSum struct {
	Err     int64   // access error or so
	Size    int64   // content size
	DupSize int64   // content size from hard links
	Blocks  int64   // number of blocks (of 512 bytes)
	DupBlocks int64 // Blocks pointed from hard links
	HLinks  int64   // hard links
	Words   int64
	Lines   int64
	Files   int64
	Dirs    int64   // the num. of directories
	SymLink int64
	Flats   int64   // the num. of flat files
	MaxDepth        int64
	MaxNamlen       int64   // max. name length
	nextRepo        time.Time
}
func showFusage(dir string,fusage *fileSum){
	bsume := float64(((fusage.Blocks-fusage.DupBlocks)/2)*1024)/1000000.0
	//bsumdup := float64((fusage.Blocks/2)*1024)/1000000.0

	fmt.Printf("%v: %v files (%vd %vs %vh) %.6f MB (%.2f MBK)\n",
		dir,
		fusage.Files,
		fusage.Dirs,
		fusage.SymLink,
		fusage.HLinks,
		float64(fusage.Size)/1000000.0,bsume);
```

```
}
const (
        S_IFMT    = 0170000
        S_IFCHR   = 0020000
        S_IFDIR   = 0040000
        S_IFREG   = 0100000
        S_IFLNK   = 0120000
        S_IFSOCK  = 0140000
)
func cumFinfo(fsum *fileSum, path string, staterr error, fstat syscall.Stat_t, argv[]string,
        now := time.Now()
        if time.Second <= now.Sub(fsum.nextRepo) {
                if !fsum.nextRepo.IsZero(){
                        tstmp := now.Format(time.Stamp)
                        showFusage(tstmp,fsum)
                }
                fsum.nextRepo = now.Add(time.Second)
        }
        if staterr != nil {
                fsum.Err += 1
                return fsum
        }
        fsum.Files += 1
        if 1 < fstat.Nlink {
                // must count only once...
                // at least ignore ones in the same directory
                //if finfo.Mode().IsRegular() {
                if (fstat.Mode & S_IFMT) == S_IFREG {
                        fsum.HLinks += 1
                        fsum.DupBlocks += int64(fstat.Blocks)
                        //fmt.Printf("---Dup HardLink %v %s\n",fstat.Nlink,path)
                }
        }
        //fsum.Size += finfo.Size()
        fsum.Size += fstat.Size
        fsum.Blocks += int64(fstat.Blocks)
        //if verb { fmt.Printf("(%8dBlk) %s",fstat.Blocks/2,path) }
        if isin("-ls",argv){
                //if verb { fmt.Printf("%4d %8d ",fstat.Blksize,fstat.Blocks) }
//              fmt.Printf("%d\t",fstat.Blocks/2)
        }
        //if finfo.IsDir()
        if (fstat.Mode & S_IFMT) == S_IFDIR {
                fsum.Dirs += 1
        }
        //if (finfo.Mode() & os.ModeSymlink) != 0
        if (fstat.Mode & S_IFMT) == S_IFLNK {
                //if verb { fmt.Printf("symlink(%v,%s)\n",fstat.Mode,finfo.Name()) }
                //{ fmt.Printf("symlink(%o,%s)\n",fstat.Mode,finfo.Name()) }
                fsum.SymLink += 1
        }
        return fsum
}
func xxFindEntv(gshCtx GshContext,depth int,total *fileSum,dir string, dstat syscall.Stat_t,
        nols := isin("-grep",argv)
        // sort entv
        /*
```

```
if isin("-t",argv){
        sort.Slice(filev, func(i,j int) bool {
                return 0 < filev[i].ModTime().Sub(filev[j].ModTime())
        })
}
*/
        /*
        if isin("-u",argv){
                sort.Slice(filev, func(i,j int) bool {
                        return 0 < filev[i].AccTime().Sub(filev[j].AccTime())
                })
        }
        if isin("-U",argv){
                sort.Slice(filev, func(i,j int) bool {
                        return 0 < filev[i].CreatTime().Sub(filev[j].CreatTime())
                })
        }
        */
/*
if isin("-S",argv){
        sort.Slice(filev, func(i,j int) bool {
                return filev[j].Size() < filev[i].Size()
        })
}
*/
for _,filename := range entv {
        for _,npat := range npatv {
                match := true
                if npat == "*" {
                        match = true
                }else{
                        match, _ = filepath.Match(npat,filename)
                }
                path := dir + DIRSEP + filename
                if !match {
                        continue
                }
                var fstat syscall.Stat_t
                staterr := syscall.Lstat(path,&fstat)
                if staterr != nil {
                        if !isin("-w",argv){fmt.Printf("ufind: %v\n",staterr) }
                        continue;
                }
                if isin("-du",argv) && (fstat.Mode & S_IFMT) == S_IFDIR {
                        // should not show size of directory in "-du" mode ...
                }else
                if !nols && !isin("-s",argv) && (!isin("-du",argv) || isin("-a",argv
                        if isin("-du",argv) {
                                fmt.Printf("%d\t",fstat.Blocks/2)
                        }
                        showFileInfo(path,argv)
                }
                if true { // && isin("-du",argv)
                        total = cumFinfo(total,path,staterr,fstat,argv,false)
                }
                /*
                if isin("-wc",argv) {
				}
				*/
				x := isinX("-grep",argv); // -grep will be convenient like -ls
				if 0 <= x && x+1 <= len(argv) { // -grep will be convenient like -ls
					if IsRegFile(path){
						found := xGrep(gshCtx,path,argv[x+1:])
						if 0 < found {
							foundv := gshCtx.CmdCurrent.FoundFile
							if len(foundv) < 10 {
								gshCtx.CmdCurrent.FoundFile =
								append(gshCtx.CmdCurrent.FoundFile,pa
							}
						}
					}
				}
				if !isin("-r0",argv) { // -d 0 in du, -depth n in find
					//total.Depth += 1
					if (fstat.Mode & S_IFMT) == S_IFLNK {
						continue
					}
					if dstat.Rdev != fstat.Rdev {
						fmt.Printf("--I-- don't follow differnet device %v(%v
							dir,dstat.Rdev,path,fstat.Rdev)
					}
					if (fstat.Mode & S_IFMT) == S_IFDIR {
						gshCtx,total = xxFind(gshCtx,depth+1,total,path,npatv
					}
				}
			}
		}
		return gshCtx,total
}
func xxFind(gshCtx GshContext,depth int,total *fileSum,dir string,npatv[]string,argv[]string
		nols := isin("-grep",argv)
		dirfile,oerr := os.OpenFile(dir,os.O_RDONLY,0)
		if oerr == nil {
			//fmt.Printf("--I-- %v(%v)[%d]\n",dir,dirfile,dirfile.Fd())
			defer dirfile.Close()
		}else{
		}

		prev := *total
		var dstat syscall.Stat_t
		staterr := syscall.Lstat(dir,&dstat) // should be flstat

		if staterr != nil {
			if !isin("-w",argv){ fmt.Printf("ufind: %v\n",staterr) }
			return gshCtx,total
		}
			//filev,err := ioutil.ReadDir(dir)
			//_,err := ioutil.ReadDir(dir) // ReadDir() heavy and bad for huge directory
			/*
			if err != nil {
				if !isin("-w",argv){ fmt.Printf("ufind: %v\n",err) }
				return total
			}
			*/
```

```
	if depth == 0 {
		total = cumFinfo(total,dir,staterr,dstat,argv,true)
		if !nols && !isin("-s",argv) && (!isin("-du",argv) || isin("-a",argv)) {
			showFileInfo(dir,argv)
		}
	}
	// it it is not a directory, just scan it and finish

	for ei := 0; ; ei++ {
		entv,rderr := dirfile.Readdirnames(8*1024)
		if len(entv) == 0 || rderr != nil {
			//if rderr != nil { fmt.Printf("[%d] len=%d (%v)\n",ei,len(entv),rde
			break
		}
		if 0 < ei {
			fmt.Printf("--I-- xxFind[%d] %d large-dir: %s\n",ei,len(entv),dir)
		}
		gshCtx,total = xxFindEntv(gshCtx,depth,total,dir,dstat,ei,entv,npatv,argv)
	}
	if isin("-du",argv) {
		// if in "du" mode
		fmt.Printf("%d\t%s\n",(total.Blocks-prev.Blocks)/2,dir)
	}
	return gshCtx,total
}

// {ufind|fu|ls} [Files] [// Names] [-- Expressions]
//  Files is "." by default
//  Names is "*" by default
//  Expressions is "-print" by default for "ufind", or -du for "fu" command
func xFind(gshCtx GshContext,argv[]string)(GshContext){
	if 0 < len(argv) && strBegins(argv[0],"?"){
		showFound(gshCtx,argv)
		return gshCtx
	}
	var total = fileSum{}
	npats := []string{}
	for _,v := range argv {
		if 0 < len(v) && v[0] != '-' {
			npats = append(npats,v)
		}
		if v == "//" { break }
		if v == "--" { break }
		if v == "-grep" { break }
		if v == "-ls" { break }
	}
	if len(npats) == 0 {
		npats = []string{"*"}
	}
	cwd := "."
	// if to be fullpath ::: cwd, _ := os.Getwd()
	if len(npats) == 0 { npats = []string{"*"} }
	gshCtx,fusage := xxFind(gshCtx,0,&total,cwd,npats,argv)
	if !isin("-grep",argv) {
		showFusage("total",fusage)
	}
	return gshCtx
```

```
}

func showFiles(files[]string){
	sp := ""
	for i,file := range files {
		if 0 < i { sp = " " } else { sp = "" }
		fmt.Printf(sp+"%s",escapeWhiteSP(file))
	}
}
func showFound(gshCtx GshContext, argv[]string){
	for i,v := range gshCtx.CommandHistory {
		if 0 < len(v.FoundFile) {
			fmt.Printf("!%d (%d) ",i,len(v.FoundFile))
			if isin("-ls",argv){
				fmt.Printf("\n")
				for _,file := range v.FoundFile {
					fmt.Printf("") //sub number?
					showFileInfo(file,argv)
				}
			}else{
				showFiles(v.FoundFile)
				fmt.Printf("\n")
			}
		}
	}
}

func showMatchFile(filev []os.FileInfo, npat,dir string, argv[]string)(string,bool){
	fname := ""
	found := false
	for _,v := range filev {
		match, _ := filepath.Match(npat,(v.Name()))
		if match {
			fname = v.Name()
			found = true
			//fmt.Printf("[%d] %s\n",i,v.Name())
			showIfExecutable(fname,dir,argv)
		}
	}
	return fname,found
}
func showIfExecutable(name,dir string,argv[]string)(ffullpath string,ffound bool){
	var fullpath string
	if strBegins(name,DIRSEP){
		fullpath = name
	}else{
		fullpath = dir + DIRSEP + name
	}
	fi, err := os.Stat(fullpath)
	if err != nil {
		fullpath = dir + DIRSEP + name + ".go"
		fi, err = os.Stat(fullpath)
	}
	if err == nil {
		fm := fi.Mode()
		if fm.IsRegular() {
		  // R_OK=4, W_OK=2, X_OK=1, F_OK=0
```

```
                    if syscall.Access(fullpath,5) == nil {
                          ffullpath = fullpath
                          ffound = true
                          if ! isin("-s", argv) {
                                  showFileInfo(fullpath,argv)
                          }
                    }
                }
        }
        return ffullpath, ffound
}
func which(list string, argv []string) (fullpathv []string, itis bool){
        if len(argv) <= 1 {
                fmt.Printf("Usage: which comand [-s] [-a] [-ls]\n")
                return []string{""}, false
        }
        path := argv[1]
        if strBegins(path,"/") {
                // should check if excecutable?
                _,exOK := showIfExecutable(path,"/",argv)
                fmt.Printf("--D-- %v exOK=%v\n",path,exOK)
                return []string{path},exOK
        }
        pathenv, efound := os.LookupEnv(list)
        if ! efound {
                fmt.Printf("--E-- which: no \"%s\" environment\n",list)
                return []string{""}, false
        }
        showall := isin("-a",argv) || 0 <= strings.Index(path,"*")
        dirv := strings.Split(pathenv,PATHSEP)
        ffound := false
        ffullpath := path
        for _, dir := range dirv {
                if 0 <= strings.Index(path,"*") { // by wild-card
                        list,_ := ioutil.ReadDir(dir)
                        ffullpath, ffound = showMatchFile(list,path,dir,argv)
                }else{
                        ffullpath, ffound = showIfExecutable(path,dir,argv)
                }
                //if ffound && !isin("-a", argv) {
                if ffound && !showall {
                        break;
                }
        }
        return []string{ffullpath}, ffound
}

func stripLeadingWSParg(argv[]string)([]string){
        for ; 0 < len(argv); {
                if len(argv[0]) == 0 {
                        argv = argv[1:]
                }else{
                        break
                }
        }
        return argv
}
```

```
func xEval(argv []string, nlend bool){
	argv = stripLeadingWSParg(argv)
	if len(argv) == 0 {
		fmt.Printf("eval [%%format] [Go-expression]\n")
		return
	}
	pfmt := "%v"
	if argv[0][0] == '%' {
		pfmt = argv[0]
		argv = argv[1:]
	}
	if len(argv) == 0 {
		return
	}
	gocode := strings.Join(argv," ");
	//fmt.Printf("eval [%v] [%v]\n",pfmt,gocode)
	fset := token.NewFileSet()
	rval, _ := types.Eval(fset,nil,token.NoPos,gocode)
	fmt.Printf(pfmt,rval.Value)
	if nlend { fmt.Printf("\n") }
}

func getval(name string) (found bool, val int) {
	/* should expand the name here */
	if name == "gsh.pid" {
		return true, os.Getpid()
	}else
	if name == "gsh.ppid" {
		return true, os.Getppid()
	}
	return false, 0
}

func echo(argv []string, nlend bool){
	for ai := 1; ai < len(argv); ai++ {
		if 1 < ai {
			fmt.Printf(" ");
		}
		arg := argv[ai]
		found, val := getval(arg)
		if found {
			fmt.Printf("%d",val)
		}else{
			fmt.Printf("%s",arg)
		}
	}
	if nlend {
		fmt.Printf("\n");
	}
}

func resfile() string {
	return "gsh.tmp"
}
//var resF *File
func resmap() {
	//_ , err := os.OpenFile(resfile(), os.O_RDWR|os.O_CREATE, os.ModeAppend)
```

```
        // https://developpaper.com/solution-to-golang-bad-file-descriptor-problem/
        _ , err := os.OpenFile(resfile(), os.O_RDWR|os.O_CREATE, 0600)
        if err != nil {
                fmt.Printf("refF could not open: %s\n",err)
        }else{
                fmt.Printf("refF opened\n")
        }
}

// External commands
func excommand(gshCtx GshContext, exec bool, argv []string) (GshContext, bool) {
        if gshCtx.CmdTrace { fmt.Printf("--I-- excommand[%v](%v)\n",exec,argv) }

        gshPA := gshCtx.gshPA
        fullpathv, itis := which("PATH",[]string{"which",argv[0],"-s"})
        if itis == false {
                return gshCtx, true
        }
        fullpath := fullpathv[0]
        argv = unescapeWhiteSPV(argv)
        if 0 < strings.Index(fullpath,".go") {
                nargv := argv // []string{}
                gofullpathv, itis := which("PATH",[]string{"which","go","-s"})
                if itis == false {
                        fmt.Printf("--F-- Go not found\n")
                        return gshCtx, true
                }
                gofullpath := gofullpathv[0]
                nargv = []string{ gofullpath, "run", fullpath }
                fmt.Printf("--I-- %s {%s %s %s}\n",gofullpath,
                        nargv[0],nargv[1],nargv[2])
                if exec {
                        syscall.Exec(gofullpath,nargv,os.Environ())
                }else{
                        pid, _ := syscall.ForkExec(gofullpath,nargv,&gshPA)
                        if gshCtx.BackGround {
                                fmt.Printf("--I-- in Background [%d]\n",pid)
                                gshCtx.BackGroundJobs = append(gshCtx.BackGroundJobs,pid)
                        }else{
                                rusage := syscall.Rusage {}
                                syscall.Wait4(pid,nil,0,&rusage)
                                gshCtx.LastRusage = rusage
                                gshCtx.CmdCurrent.Rusagev[1] = rusage
                        }
                }
        }else{
                if exec {
                        syscall.Exec(fullpath,argv,os.Environ())
                }else{
                        pid, _ := syscall.ForkExec(fullpath,argv,&gshPA)
                        //fmt.Printf("[%d]\n",pid); // '&' to be background
                        if gshCtx.BackGround {
                                fmt.Printf("--I-- in Background [%d]\n",pid)
                                gshCtx.BackGroundJobs = append(gshCtx.BackGroundJobs,pid)
                        }else{
                                rusage := syscall.Rusage {}
                                syscall.Wait4(pid,nil,0,&rusage);
                                gshCtx.LastRusage = rusage
                                gshCtx.CmdCurrent.Rusagev[1] = rusage
                        }
                }
        }
        return gshCtx, false
}

// Builtin Commands
func sleep(gshCtx GshContext, argv []string) {
        if len(argv) < 2 {
                fmt.Printf("Sleep 100ms, 100us, 100ns, ...\n")
                return
        }
        duration := argv[1];
        d, err := time.ParseDuration(duration)
        if err != nil {
                d, err = time.ParseDuration(duration+"s")
                if err != nil {
                        fmt.Printf("duration ? %s (%s)\n",duration,err)
                        return
                }
        }
        //fmt.Printf("Sleep %v\n",duration)
        time.Sleep(d)
        if 0 < len(argv[2:]) {
                gshellv(gshCtx, argv[2:])
        }
}
func repeat(gshCtx GshContext, argv []string) {
        if len(argv) < 2 {
                return
        }
        start0 := time.Now()
        for ri,_ := strconv.Atoi(argv[1]); 0 < ri; ri-- {
                if 0 < len(argv[2:]) {
                        //start := time.Now()
                        gshellv(gshCtx, argv[2:])
                        end := time.Now()
                        elps := end.Sub(start0);
                        if( 1000000000 < elps ){
                                fmt.Printf("(repeat#%d %v)\n",ri,elps);
                        }
                }
        }
}

func gen(gshCtx GshContext, argv []string) {
        gshPA := gshCtx.gshPA
        if len(argv) < 2 {
                fmt.Printf("Usage: %s N\n",argv[0])
                return
        }
        // should br repeated by "repeat" command
        count, _ := strconv.Atoi(argv[1])
        fd := gshPA.Files[1] // Stdout
        file := os.NewFile(fd,"internalStdOut")
```

```
	fmt.Printf("--I-- Gen. Count=%d to [%d]\n",count,file.Fd())
	//buf := []byte{}
	outdata := "0123 5678 0123 5678 0123 5678 0123 5678\r"
	for gi := 0; gi < count; gi++ {
		file.WriteString(outdata)
	}
	//file.WriteString("\n")
	fmt.Printf("\n(%d B)\n",count*len(outdata));
	//file.Close()
}

// network
// -s, -si, -so // bi-directional, source, sync (maybe socket)
func sconnect(gshCtx GshContext, inTCP bool, argv []string) {
	gshPA := gshCtx.gshPA
	if len(argv) < 2 {
		fmt.Printf("Usage: -s [host]:[port[.udp]]\n")
		return
	}
	remote := argv[1]
	if remote == ":" { remote = "0.0.0.0:9999" }

	if inTCP { // TCP
		dport, err := net.ResolveTCPAddr("tcp",remote);
		if err != nil {
			fmt.Printf("Address error: %s (%s)\n",remote,err)
			return
		}
		conn, err := net.DialTCP("tcp",nil,dport)
		if err != nil {
			fmt.Printf("Connection error: %s (%s)\n",remote,err)
			return
		}
		file, _ := conn.File();
		fd := file.Fd()
		fmt.Printf("Socket: connected to %s, socket[%d]\n",remote,fd)

		savfd := gshPA.Files[1]
		gshPA.Files[1] = fd;
		gshellv(gshCtx, argv[2:])
		gshPA.Files[1] = savfd
		file.Close()
		conn.Close()
	}else{
		//dport, err := net.ResolveUDPAddr("udp4",remote);
		dport, err := net.ResolveUDPAddr("udp",remote);
		if err != nil {
			fmt.Printf("Address error: %s (%s)\n",remote,err)
			return
		}
		//conn, err := net.DialUDP("udp4",nil,dport)
		conn, err := net.DialUDP("udp",nil,dport)
		if err != nil {
			fmt.Printf("Connection error: %s (%s)\n",remote,err)
			return
		}
		file, _ := conn.File();
```

```
                fd := file.Fd()

                ar := conn.RemoteAddr()
                //al := conn.LocalAddr()
                fmt.Printf("Socket: connected to %s [%s], socket[%d]\n",
                        remote,ar.String(),fd)

                savfd := gshPA.Files[1]
                gshPA.Files[1] = fd;
                gshellv(gshCtx, argv[2:])
                gshPA.Files[1] = savfd
                file.Close()
                conn.Close()
        }
}
func saccept(gshCtx GshContext, inTCP bool, argv []string) {
        gshPA := gshCtx.gshPA
        if len(argv) < 2 {
                fmt.Printf("Usage: -ac [host]:[port[.udp]]\n")
                return
        }
        local := argv[1]
        if local == ":" { local = "0.0.0.0:9999" }
        if inTCP { // TCP
                port, err := net.ResolveTCPAddr("tcp",local);
                if err != nil {
                        fmt.Printf("Address error: %s (%s)\n",local,err)
                        return
                }
                //fmt.Printf("Listen at %s...\n",local);
                sconn, err := net.ListenTCP("tcp", port)
                if err != nil {
                        fmt.Printf("Listen error: %s (%s)\n",local,err)
                        return
                }
                //fmt.Printf("Accepting at %s...\n",local);
                aconn, err := sconn.AcceptTCP()
                if err != nil {
                        fmt.Printf("Accept error: %s (%s)\n",local,err)
                        return
                }
                file, _ := aconn.File()
                fd := file.Fd()
                fmt.Printf("Accepted TCP at %s [%d]\n",local,fd)

                savfd := gshPA.Files[0]
                gshPA.Files[0] = fd;
                gshellv(gshCtx, argv[2:])
                gshPA.Files[0] = savfd

                sconn.Close();
                aconn.Close();
                file.Close();
        }else{
                //port, err := net.ResolveUDPAddr("udp4",local);
                port, err := net.ResolveUDPAddr("udp",local);
                if err != nil {
```

```
				fmt.Printf("Address error: %s (%s)\n",local,err)
				return
			}
			fmt.Printf("Listen UDP at %s...\n",local);
			//uconn, err := net.ListenUDP("udp4", port)
			uconn, err := net.ListenUDP("udp", port)
			if err != nil {
				fmt.Printf("Listen error: %s (%s)\n",local,err)
				return
			}
			file, _ := uconn.File()
			fd := file.Fd()
			ar := uconn.RemoteAddr()
			remote := ""
			if ar != nil { remote = ar.String() }
			if remote == "" { remote = "?" }

			// not yet received
			//fmt.Printf("Accepted at %s [%d] <- %s\n",local,fd,"")

			savfd := gshPA.Files[0]
			gshPA.Files[0] = fd;
			savenv := gshPA.Env
			gshPA.Env = append(savenv, "REMOTE_HOST="+remote)
			gshellv(gshCtx, argv[2:])
			gshPA.Env = savenv
			gshPA.Files[0] = savfd

			uconn.Close();
			file.Close();
		}
}

// empty line command
func xPwd(gshCtx GshContext, argv[]string){
		// execute context command, pwd + date
		// context notation, representation scheme, to be resumed at re-login
		cwd, _ := os.Getwd()
		switch {
		case isin("-a",argv):
			xChdirHistory(gshCtx,argv)
		case isin("-ls",argv):
			showFileInfo(cwd,argv)
		default:
			fmt.Printf("%s\n",cwd)
		case isin("-v",argv): // obsolete emtpy command
			t := time.Now()
			date := t.Format(time.UnixDate)
			exe, _ := os.Executable()
			host, _ := os.Hostname()
			fmt.Printf("{PWD=\"%s\"",cwd)
			fmt.Printf(" HOST=\"%s\"",host)
			fmt.Printf(" DATE=\"%s\"",date)
			fmt.Printf(" TIME=\"%s\"",t.String())
			fmt.Printf(" PID=\"%d\"",os.Getpid())
			fmt.Printf(" EXE=\"%s\"",exe)
			fmt.Printf("}\n")
```

```
        }
}

// History
// these should be browsed and edited by HTTP browser
// show the time of command with -t and direcotry with -ls
// openfile-history, sort by -a -m -c
// sort by elapsed time by -t -s
// search by "more" like interface
// edit history
// sort history, and wc or uniq
// CPU and other resource consumptions
// limit showing range (by time or so)
// export / import history
func xHistory(gshCtx GshContext, argv []string) (rgshCtx GshContext) {
        for i, v := range gshCtx.CommandHistory {
                // exclude commands not to be listed by default
                // internal commands may be suppressed by default
                if v.CmdLine == "" && !isin("-a",argv) {
                        continue;
                }
                if !isin("-n",argv){ // like "fc"
                        fmt.Printf("!%-3d ",i)
                }
                if isin("-v",argv){
                        fmt.Println(v) // should be with it date
                }else{
                        if isin("-l",argv) || isin("-l0",argv) {
                                elps := v.EndAt.Sub(v.StartAt);
                                start := v.StartAt.Format(time.Stamp)
                                fmt.Printf("%s %11v/t ",start,elps)
                        }
                        if isin("-l",argv) && !isin("-l0",argv){
                                fmt.Printf("%v",Rusagef("%t %u %s",argv,v.Rusagev))
                        }
                        if isin("-ls",argv){
                                fmt.Printf("@%s ",v.WorkDir)
                                // show the FileInfo of the output command??
                        }
                        fmt.Printf("%s",v.CmdLine)
                        fmt.Printf("\n")
                }
        }
        return gshCtx
}
// !n - history index
func searchHistory(gshCtx GshContext, gline string) (string, bool, bool){
        if gline[0] == '!' {
                hix, err := strconv.Atoi(gline[1:])
                if err != nil {
                        fmt.Printf("--E-- (%s : range)\n",hix)
                        return "", false, true
                }
                if hix < 0 || len(gshCtx.CommandHistory) <= hix {
                        fmt.Printf("--E-- (%d : out of range)\n",hix)
                        return "", false, true
                }
```

```
			return gshCtx.CommandHistory[hix].CmdLine, false, false
		}
		// search
		//for i, v := range gshCtx.CommandHistory {
		//}
		return gline, false, false
}

// temporary adding to PATH environment
// cd name -lib for LD_LIBRARY_PATH
// chdir with directory history (date + full-path)
// -s for sort option (by visit date or so)
func xChdirHistory(gshCtx GshContext, argv []string){
		for i, v := range gshCtx.ChdirHistory {
			fmt.Printf("!%d ",i)
			fmt.Printf("%v ",v.MovedAt.Format(time.Stamp))
			showFileInfo(v.Dir,argv)
		}
}
func xChdir(gshCtx GshContext, argv []string) (rgshCtx GshContext) {
		cdhist := gshCtx.ChdirHistory
		if isin("?",argv ) || isin("-t",argv) {
			xChdirHistory(gshCtx,argv)
			return gshCtx
		}
		pwd, _ := os.Getwd()
		dir := ""
		if len(argv) <= 1 {
			dir = toFullpath("~")
		}else{
			dir = argv[1]
		}
		if strBegins(dir,"!") {
			if dir == "!0" {
				dir = gshCtx.StartDir
			}else
			if dir == "!!" {
				index := len(cdhist) - 1
				if 0 < index { index -= 1 }
				dir = cdhist[index].Dir
			}else{
				index, err := strconv.Atoi(dir[1:])
				if err != nil {
					fmt.Printf("--E-- xChdir(%v)\n",err)
					dir = "?"
				}else
				if len(gshCtx.ChdirHistory) <= index {
					fmt.Printf("--E-- xChdir(history range error)\n")
					dir = "?"
				}else{
					dir = cdhist[index].Dir
				}
			}
		}
		if dir != "?" {
			err := os.Chdir(dir)
			if err != nil {
					fmt.Printf("--E-- xChdir(%s)(%v)\n",argv[1],err)
				}else{
					cwd, _ := os.Getwd()
					if cwd != pwd {
						hist1 := GChdirHistory { }
						hist1.Dir = cwd
						hist1.MovedAt = time.Now()
						gshCtx.ChdirHistory = append(cdhist,hist1)
					}
				}
		}
		if isin("-ls",argv){
			cwd, _ := os.Getwd()
			showFileInfo(cwd,argv);
		}
		return gshCtx
}
func TimeValSub(tv1 *syscall.Timeval, tv2 *syscall.Timeval){
		*tv1 = syscall.NsecToTimeval(tv1.Nano() - tv2.Nano())
}
func RusageSubv(ru1, ru2 [2]syscall.Rusage)([2]syscall.Rusage){
		TimeValSub(&ru1[0].Utime,&ru2[0].Utime)
		TimeValSub(&ru1[0].Stime,&ru2[0].Stime)
		TimeValSub(&ru1[1].Utime,&ru2[1].Utime)
		TimeValSub(&ru1[1].Stime,&ru2[1].Stime)
		return ru1
}
func TimeValAdd(tv1 syscall.Timeval, tv2 syscall.Timeval)(syscall.Timeval){
		tvs := syscall.NsecToTimeval(tv1.Nano() + tv2.Nano())
		return tvs
}
/*
func RusageAddv(ru1, ru2 [2]syscall.Rusage)([2]syscall.Rusage){
		TimeValAdd(ru1[0].Utime,ru2[0].Utime)
		TimeValAdd(ru1[0].Stime,ru2[0].Stime)
		TimeValAdd(ru1[1].Utime,ru2[1].Utime)
		TimeValAdd(ru1[1].Stime,ru2[1].Stime)
		return ru1
}
*/

// Resource Usage
func Rusagef(fmtspec string, argv []string, ru [2]syscall.Rusage)(string){
		ut := TimeValAdd(ru[0].Utime,ru[1].Utime)
		st := TimeValAdd(ru[0].Stime,ru[1].Stime)
		fmt.Printf("%d.%06ds/u ",ut.Sec,ut.Usec) //ru[1].Utime.Sec,ru[1].Utime.Usec)
		fmt.Printf("%d.%06ds/s ",st.Sec,st.Usec) //ru[1].Stime.Sec,ru[1].Stime.Usec)
		return ""
}
func Getrusagev()([2]syscall.Rusage){
		var ruv = [2]syscall.Rusage{}
		syscall.Getrusage(syscall.RUSAGE_SELF,&ruv[0])
		syscall.Getrusage(syscall.RUSAGE_CHILDREN,&ruv[1])
		return ruv
}
func showRusage(what string,argv []string, ru *syscall.Rusage){
		fmt.Printf("%s: ",what);
		fmt.Printf("Usr=%d.%06ds",ru.Utime.Sec,ru.Utime.Usec)
		fmt.Printf(" Sys=%d.%06ds",ru.Stime.Sec,ru.Stime.Usec)
		fmt.Printf(" Rss=%vB",ru.Maxrss)
		if isin("-l",argv) {
			fmt.Printf(" MinFlt=%v",ru.Minflt)
			fmt.Printf(" MajFlt=%v",ru.Majflt)
			fmt.Printf(" IxRSS=%vB",ru.Ixrss)
			fmt.Printf(" IdRSS=%vB",ru.Idrss)
			fmt.Printf(" Nswap=%vB",ru.Nswap)
		fmt.Printf(" Read=%v",ru.Inblock)
		fmt.Printf(" Write=%v",ru.Oublock)
		}
		fmt.Printf(" Snd=%v",ru.Msgsnd)
		fmt.Printf(" Rcv=%v",ru.Msgrcv)
		//if isin("-l",argv) {
			fmt.Printf(" Sig=%v",ru.Nsignals)
		//}
		fmt.Printf("\n");
}
func xTime(gshCtx GshContext, argv[]string)(GshContext,bool){
		if 2 <= len(argv){
			gshCtx.LastRusage = syscall.Rusage{}
			rusagev1 := Getrusagev()
			xgshCtx, fin := gshellv(gshCtx,argv[1:])
			rusagev2 := Getrusagev()
			gshCtx = xgshCtx
			showRusage(argv[1],argv,&gshCtx.LastRusage)
			rusagev := RusageSubv(rusagev2,rusagev1)
			showRusage("self",argv,&rusagev[0])
			showRusage("chld",argv,&rusagev[1])
			return gshCtx, fin
		}else{
			rusage:= syscall.Rusage {}
			syscall.Getrusage(syscall.RUSAGE_SELF,&rusage)
			showRusage("self",argv, &rusage)
			syscall.Getrusage(syscall.RUSAGE_CHILDREN,&rusage)
			showRusage("chld",argv, &rusage)
			return gshCtx, false
		}
}
func xJobs(gshCtx GshContext, argv[]string){
		fmt.Printf("%d Jobs\n",len(gshCtx.BackGroundJobs))
		for ji, pid := range gshCtx.BackGroundJobs {
			//wstat := syscall.WaitStatus {0}
			rusage := syscall.Rusage {}
			//wpid, err := syscall.Wait4(pid,&wstat,syscall.WNOHANG,&rusage);
			wpid, err := syscall.Wait4(pid,nil,syscall.WNOHANG,&rusage);
			if err != nil {
				fmt.Printf("--E-- %%%d [%d] (%v)\n",ji,pid,err)
			}else{
				fmt.Printf("%%%d[%d](%d)\n",ji,pid,wpid)
				showRusage("chld",argv,&rusage)
			}
		}
}
func inBackground(gshCtx GshContext, argv[]string)(GshContext,bool){
		if gshCtx.CmdTrace { fmt.Printf("--I-- inBackground(%v)\n",argv) }
```

```
        gshCtx.BackGround = true // set background option
        xfin := false
        gshCtx, xfin = gshellv(gshCtx,argv)
        gshCtx.BackGround = false
        return gshCtx,xfin
}
// -o file without command means just opening it and refer by #N
// should be listed by "files" comnmand
func xOpen(gshCtx GshContext, argv[]string)(GshContext){
        var pv = []int{-1,-1}
        err := syscall.Pipe(pv)
        fmt.Printf("--I-- pipe()=[#%d,#%d](%v)\n",pv[0],pv[1],err)
        return gshCtx
}
func fromPipe(gshCtx GshContext, argv[]string)(GshContext){
        return gshCtx
}
func xClose(gshCtx GshContext, argv[]string)(GshContext){
        return gshCtx
}

// redirect
func redirect(gshCtx GshContext, argv[]string)(GshContext,bool){
        if len(argv) < 2 {
                return gshCtx, false
        }

        cmd := argv[0]
        fname := argv[1]
        var file *os.File = nil

        fdix := 0
        mode := os.O_RDONLY

        switch {
        case cmd == "-i" || cmd == "<":
                fdix = 0
                mode = os.O_RDONLY
        case cmd == "-o" || cmd == ">":
                fdix = 1
                mode = os.O_RDWR | os.O_CREATE
        case cmd == "-a" || cmd == ">>":
                fdix = 1
                mode = os.O_RDWR | os.O_CREATE | os.O_APPEND
        }
        if fname[0] == '#' {
                fd, err := strconv.Atoi(fname[1:])
                if err != nil {
                        fmt.Printf("--E-- (%v)\n",err)
                        return gshCtx, false
                }
                file = os.NewFile(uintptr(fd),"MaybePipe")
        }else{
                xfile, err := os.OpenFile(argv[1], mode, 0600)
                if err != nil {
                        fmt.Printf("--E-- (%s)\n",err)
                        return gshCtx, false
```

```
		}
		file = xfile
	}
	gshPA := gshCtx.gshPA
	savfd := gshPA.Files[fdix]
	gshPA.Files[fdix] = file.Fd()
	fmt.Printf("--I-- Opened [%d] %s\n",file.Fd(),argv[1])
	gshCtx, _ = gshellv(gshCtx, argv[2:])
	gshPA.Files[fdix] = savfd

	return gshCtx, false
}

//fmt.Fprintf(res, "GShell Status: %q", html.EscapeString(req.URL.Path))
func httpHandler(res http.ResponseWriter, req *http.Request){
	path := req.URL.Path
	fmt.Printf("--I-- Got HTTP Request(%s)\n",path)
	{
		gshCtx, _ :=  setupGshContext()
		fmt.Printf("--I-- %s\n",path[1:])
		gshCtx, _ = tgshelll(gshCtx,path[1:])
	}
	fmt.Fprintf(res, "Hello(^-^)/\n%s\n",path)
}
func httpServer(gshCtx GshContext, argv []string){
	http.HandleFunc("/", httpHandler)
	accport := "localhost:9999"
	fmt.Printf("--I-- HTTP Server Start at [%s]\n",accport)
	http.ListenAndServe(accport,nil)
}
func xGo(gshCtx GshContext, argv[]string){
	go gshellv(gshCtx,argv[1:]);
}
func xPs(gshCtx GshContext, argv[]string)(GshContext){
	return gshCtx
}

// Plugin
// plugin [-ls [names]] to list plugins
// Reference: plugin source code
func whichPlugin(gshCtx GshContext,name string,argv[]string)(pi *PluginInfo){
	pi = nil
	for _,p := range gshCtx.PluginFuncs {
		if p.Name == name && pi == nil {
			pi = &p
		}
		if !isin("-s",argv){
			//fmt.Printf("%v %v ",i,p)
			if isin("-ls",argv){
				showFileInfo(p.Path,argv)
			}else{
				fmt.Printf("%s\n",p.Name)
			}
		}
	}
	return pi
}
```

```
func xPlugin(gshCtx GshContext, argv[]string)(GshContext,error){
	if len(argv) == 0 || argv[0] == "-ls" {
		whichPlugin(gshCtx,"",argv)
		return gshCtx, nil
	}
	name := argv[0]
	Pin := whichPlugin(gshCtx,name,[]string{"-s"})
	if Pin != nil {
		os.Args = argv // should be recovered?
		Pin.Addr.(func())()
		return gshCtx,nil
	}
	sofile := toFullpath(argv[0] + ".so") // or find it by which($PATH)

	p, err := plugin.Open(sofile)
	if err != nil {
		fmt.Printf("--E-- plugin.Open(%s)(%v)\n",sofile,err)
		return gshCtx, err
	}
	fname := "Main"
	f, err := p.Lookup(fname)
	if( err != nil ){
		fmt.Printf("--E-- plugin.Lookup(%s)(%v)\n",fname,err)
		return gshCtx, err
	}
	pin := PluginInfo {p,f,name,sofile}
	gshCtx.PluginFuncs = append(gshCtx.PluginFuncs,pin)
	fmt.Printf("--I-- added (%d)\n",len(gshCtx.PluginFuncs))

	//fmt.Printf("--I-- first call(%s:%s)%v\n",sofile,fname,argv)
	os.Args = argv
	f.(func())()
	return gshCtx, err
}

// Command Interpreter
func gshellv(gshCtx GshContext, argv []string) (_ GshContext, fin bool) {
	fin = false

	if gshCtx.CmdTrace { fmt.Fprintf(os.Stderr,"--I-- gshellv((%d))\n",len(argv)) }
	if len(argv) <= 0 {
		return gshCtx, false
	}
	xargv := []string{}
	for ai := 0; ai < len(argv); ai++ {
		xargv = append(xargv,strsubst(&gshCtx,argv[ai],false))
	}
	argv = xargv
	if false {
		for ai := 0; ai < len(argv); ai++ {
			fmt.Printf("[%d] %s [%d]%T\n",
				ai,argv[ai],len(argv[ai]),argv[ai])
		}
	}
	cmd := argv[0]
	if gshCtx.CmdTrace { fmt.Fprintf(os.Stderr,"--I-- gshellv(%d)%v\n",len(argv),argv) }
	switch { // https://tour.golang.org/flowcontrol/11
```

```
        case cmd == "":
                xPwd(gshCtx,[]string{}); // emtpy command
        case cmd == "-x":
                gshCtx.CmdTrace = ! gshCtx.CmdTrace
        case cmd == "-ot":
                sconnect(gshCtx, true, argv)
        case cmd == "-ou":
                sconnect(gshCtx, false, argv)
        case cmd == "-it":
                saccept(gshCtx, true , argv)
        case cmd == "-iu":
                saccept(gshCtx, false, argv)
        case cmd == "-i" || cmd == "<" || cmd == "-o" || cmd == ">" || cmd == "-a" || cmd ==
                redirect(gshCtx, argv)
        case cmd == "|":
                gshCtx = fromPipe(gshCtx, argv)
        case cmd == "bg" || cmd == "-bg":
                rgshCtx, rfin := inBackground(gshCtx,argv[1:])
                return rgshCtx, rfin
        case cmd == "call":
                gshCtx, _ = excommand(gshCtx, false,argv[1:])
        case cmd == "cd" || cmd == "chdir":
                gshCtx = xChdir(gshCtx,argv);
        case cmd == "close":
                gshCtx = xClose(gshCtx,argv)
        case cmd == "#define":
        case cmd == "echo":
                echo(argv,true)
        case cmd == "env":
                env(argv)
        case cmd == "eval":
                xEval(argv[1:],true)
        case cmd == "exec":
                gshCtx, _ = excommand(gshCtx, true,argv[1:])
                // should not return here
        case cmd == "exit" || cmd == "quit":
                // write Result code EXIT to 3>
                return gshCtx, true
        case cmd == "-find" || cmd == "fin" || cmd == "ufind" || cmd == "uf" || cmd == "fu":
                gshCtx = xFind(gshCtx,argv[1:])
        case cmd == "fork":
                // mainly for a server
        case cmd == "-gen":
                gen(gshCtx, argv)
        case cmd == "-go":
                xGo(gshCtx, argv)
        case cmd == "-grep":
                gshCtx = xFind(gshCtx,argv)
        case cmd == "history" || cmd == "hi": // hi should be alias
                gshCtx = xHistory(gshCtx, argv)
        case cmd == "jobs":
                xJobs(gshCtx,argv)
        case cmd == "-ls":
                gshCtx = xFind(gshCtx,argv)
        case cmd == "nop":
        case cmd == "pipe":
                gshCtx = xOpen(gshCtx,argv)
```

```
	case cmd == "plug" || cmd == "plugin" || cmd == "pin":
		gshCtx,_ = xPlugin(gshCtx,argv[1:])
	case cmd == "ps":
		xPs(gshCtx,argv)
	case cmd == "pstitle": // to be gsh.title
	case cmd == "repeat" || cmd == "rep": // repeat cond command
		repeat(gshCtx,argv)
	case cmd == "set":
		// set name ...
	case cmd == "serv":
		httpServer(gshCtx,argv)
	case cmd == "sleep":
		sleep(gshCtx,argv)
	case cmd == "time":
		gshCtx, fin = xTime(gshCtx,argv)
	case cmd == "pwd":
		xPwd(gshCtx,argv);
	case cmd == "ver" || cmd == "-ver":
		fmt.Printf("%s\n",VERSION);
	case cmd == "where":
		// data file or so?
	case cmd == "which":
		which("PATH",argv);
	default:
		if whichPlugin(gshCtx,cmd,[]string{"-s"}) != nil {
			gshCtx, _ = xPlugin(gshCtx,argv)
		}else{
			gshCtx, _ = excommand(gshCtx,false,argv)
		}
	}
	return gshCtx, fin
}

func gshelll(gshCtx GshContext, gline string) (gx GshContext, rfin bool) {
	argv := strings.Split(string(gline)," ")
	gshCtx, fin := gshellv(gshCtx,argv)
	return gshCtx, fin
}
func tgshelll(gshCtx GshContext, gline string) (gx GshContext, xfin bool) {
	start := time.Now()
	gshCtx, fin := gshelll(gshCtx,gline)
	end := time.Now()
	elps := end.Sub(start);
	fmt.Printf("--I-- " + time.Now().Format(time.Stamp) + "(%d.%09ds)\n",
		elps/1000000000,elps%1000000000)
	return gshCtx, fin
}
func Ttyid() (int) {
	fi, err := os.Stdin.Stat()
	if err != nil {
		return 0;
	}
	//fmt.Printf("Stdin: %v Dev=%d\n",
	//	fi.Mode(),fi.Mode()&os.ModeDevice)
	if (fi.Mode() & os.ModeDevice) != 0 {
		stat := syscall.Stat_t{};
		err := syscall.Fstat(0,&stat)
```

```
                if err != nil {
                        //fmt.Printf("--I-- Stdin: (%v)\n",err)
                }else{
                        //fmt.Printf("--I-- Stdin: rdev=%d %d\n",
                        //      stat.Rdev&0xFF,stat.Rdev);
                        //fmt.Printf("--I-- Stdin: tty%d\n",stat.Rdev&0xFF);
                        return int(stat.Rdev & 0xFF)
                }
        }
        return 0
}
func ttyfile(gshCtx GshContext) string {
        //fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
        ttyfile := gshCtx.GshHomeDir + "/" + "gsh-tty" +
                 fmt.Sprintf("%02d",gshCtx.TerminalId)
                 //strconv.Itoa(gshCtx.TerminalId)
        //fmt.Printf("--I-- ttyfile=%s\n",ttyfile)
        return ttyfile
}
func ttyline(gshCtx GshContext) (*os.File){
        file, err := os.OpenFile(ttyfile(gshCtx),
                os.O_RDWR|os.O_CREATE|os.O_TRUNC,0600)
        if err != nil {
                fmt.Printf("--F-- cannot open %s (%s)\n",ttyfile(gshCtx),err)
                return file;
        }
        return file
}
// Command Line Editor
func getline(gshCtx GshContext, hix int, skipping, with_exgetline bool, gsh_getlinev[]string
        if( skipping ){
                reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
                line, _, _ := reader.ReadLine()
                return string(line)
        }else
        if( with_exgetline && gshCtx.GetLine != "" ){
                //var xhix int64 = int64(hix); // cast
                newenv := os.Environ()
                newenv = append(newenv, "GSH_LINENO="+strconv.FormatInt(int64(hix),10) )

                tty := ttyline(gshCtx)
                tty.WriteString(prevline)
                Pa := os.ProcAttr {
                        "", // start dir
                        newenv, //os.Environ(),
                        []*os.File{os.Stdin,os.Stdout,os.Stderr,tty},
                        nil,
                }
//fmt.Printf("--I-- getline=%s // %s\n",gsh_getlinev[0],gshCtx.GetLine)
proc, err := os.StartProcess(gsh_getlinev[0],[]string{"getline","getline"},&Pa)
                if err != nil {
                        fmt.Printf("--F-- getline process error (%v)\n",err)
                        // for ; ; { }
                        return "exit (getline program failed)"
                }
                //stat, err := proc.Wait()
                proc.Wait()
                buff := make([]byte,LINESIZE)
                count, err := tty.Read(buff)
                //_, err = tty.Read(buff)
                //fmt.Printf("--D-- getline (%d)\n",count)
                if err != nil {
                        if ! (count == 0) { // && err.String() == "EOF" ) {
                                fmt.Printf("--E-- getline error (%s)\n",err)
                        }
                }else{
                        //fmt.Printf("--I-- getline OK \"%s\"\n",buff)
                }
                tty.Close()
                return string(buff[0:count])
        }else{
                // if isatty {
                        fmt.Printf("!%d",hix)
                        fmt.Print(PROMPT)
                // }
                reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
                line, _, _ := reader.ReadLine()
                return string(line)
        }
}
//
// $USERHOME/.gsh/
//              gsh-rc.txt, or gsh-configure.txt
//              gsh-history.txt
//              gsh-aliases.txt // should be conditional?
//
func gshSetupHomedir(gshCtx GshContext) (GshContext, bool) {
        homedir,found := userHomeDir()
        if !found {
                fmt.Printf("--E-- You have no UserHomeDir\n")
                return gshCtx, true
        }
        gshhome := homedir + "/" + GSH_HOME
        _, err2 := os.Stat(gshhome)
        if err2 != nil {
                err3 := os.Mkdir(gshhome,0700)
                if err3 != nil {
                        fmt.Printf("--E-- Could not Create %s (%s)\n",
                                gshhome,err3)
                        return gshCtx, true
                }
                fmt.Printf("--I-- Created %s\n",gshhome)
        }
        gshCtx.GshHomeDir = gshhome
        return gshCtx, false
}
func setupGshContext()(GshContext,bool){
        gshPA := syscall.ProcAttr {
                "", // the staring directory
                os.Environ(), // environ[]
                []uintptr{os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd()},
                nil, // OS specific
        }
        cwd, _ := os.Getwd()
```

```
	gshCtx := GshContext {
		cwd, // StartDir
		"", // GetLine
		[]GChdirHistory { {cwd,time.Now()} }, // ChdirHistory
		gshPA,
		[]GCommandHistory{}, //something for invokation?
		GCommandHistory{}, // CmdCurrent
		false,
		[]int{},
		syscall.Rusage{},
		"", // GshHomeDir
		Ttyid(),
		false,
		[]PluginInfo{},
	}
	err := false
	gshCtx, err = gshSetupHomedir(gshCtx)
	return gshCtx, err
}
// Main loop
func script(gshCtxGiven *GshContext) (_ GshContext) {
	gshCtx,err0 := setupGshContext()
	if err0 {
		return gshCtx;
	}
	//fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
	//resmap()
	gsh_getlinev, with_exgetline :=
		 which("PATH",[]string{"which","gsh-getline","-s"})
	if with_exgetline {
		gsh_getlinev[0] = toFullpath(gsh_getlinev[0])
		gshCtx.GetLine = toFullpath(gsh_getlinev[0])
	}else{
	fmt.Printf("--W-- No gsh-getline found. Using internal getline.\n");
	}

	ghist0 := gshCtx.CmdCurrent // something special, or gshrc script, or permanent hist
	gshCtx.CommandHistory = append(gshCtx.CommandHistory,ghist0)

	prevline := ""
	skipping := false
	for hix := len(gshCtx.CommandHistory); ; {
		gline := getline(gshCtx,hix,skipping,with_exgetline,gsh_getlinev,prevline)
		if skipping {
			if strings.Index(gline,"fi") == 0 {
				fmt.Printf("fi\n");
				skipping = false;
			}else{
				//fmt.Printf("%s\n",gline);
			}
			continue
		}
		if strings.Index(gline,"if") == 0 {
			//fmt.Printf("--D-- if start: %s\n",gline);
			skipping = true;
			continue
		}
```

```
                glline = strsubst(&gshCtx,gline,true)
                /*
                // should be cared in substitution ?
                if 0 < len(gline) && gline[0] == '!' {
                        xgline, set, err := searchHistory(gshCtx,gline)
                        if err {
                                continue
                        }
                        if set {
                                // set the line in command line editor
                        }
                        gline = xgline
                }
                */
                ghist := gshCtx.CmdCurrent
                ghist.WorkDir,_ = os.Getwd()
                ghist.StartAt = time.Now()
                rusagev1 := Getrusagev()
                gshCtx.CmdCurrent.FoundFile = []string{}
                xgshCtx, fin := tgshelll(gshCtx,gline)
                rusagev2 := Getrusagev()
                ghist.Rusagev = RusageSubv(rusagev2,rusagev1)
                gshCtx = xgshCtx
                ghist.EndAt = time.Now()
                ghist.CmdLine = gline
                ghist.FoundFile = gshCtx.CmdCurrent.FoundFile

                /* record it but not show in list by default
                if len(gline) == 0 {
                        continue
                }
                if gline == "hi" || gline == "history" { // don't record it
                        continue
                }
                */
                gshCtx.CommandHistory = append(gshCtx.CommandHistory, ghist)
                if fin {
                        break;
                }
                prevline = gline;
                hix++;
        }
        return gshCtx
}
func main() {
        script(nil)
        //gshCtx := script(nil)
        //gshelll(gshCtx,"time")
}
//
```

//

▶ Consideration

/*

▶ References

*/ //