Creating a Macintosh Maple Library

Suppose we wish to create a Maple Library called mylib on the root hard drive (usually named Macintosh HD) at \mylib. First create an empty folder called mylib on the root hard drive. Then execute the two following commands:

```maple
> restart;
> march('create',"/mylib",100);
```

The 100 is the maximum number of entries the library can hold. A library is only created once.

```maple
> restart;
> libname:="/mylib",libname;
```

This next command adds our library to the search tree for the libraries in use.

```maple
> with(mypack);
```

The next command checks to see which procedures are in the package mypack in the library and loads them into memory. This step should only be taken if procedures are already in the library.

We received the error message since the mypack package of procedures has yet to be created. Now we want to add Maple procedures called bisection and bisection_dir to mypack. To do this we first create the procedures.

```maple
> mypack[bisection] := proc(f::algebraic,a::numeric,b::numeric,
tol::positive,no::posint,root::name)
local A, B, TOL, C, OK, X, F, FA, FB, I, P, FP;
make sure endpoints and tolerance are of type floating point
A:=evalf(a);
B:=evalf(b);
TOL:=evalf(tol);
make sure A<B
if A > B then
X := A;
A := B;
B := X;
end if;
make f into a function F and evaluate at endpoints
F:=unapply(f,x);
FA:=F(A);
FB:=F(B);
check for errors in choice of endpoints
if A = B then
ERROR("The two endpoints of the interval \([a,b]\) must be different");
else if FA*FB > 0 then ERROR("The function values at a and b must have opposite signs");
end if;
end if;
print table headings
printf(` ` i  p                  f(p)`
),
printf(` ` -  -                  ----`
);
execute the algorithm
STEP 1
I := 1;
STEP 2
OK := TRUE;
while I <= no and OK = TRUE do
STEP 3
Compute $p_i$

\[
C := \frac{B - A}{2.0};
\]

\[
P := A + C;
\]

STEP 4

\[
FP := F(P);
\]

\[
\text{printf(`%3d   %15.8e   %15.7e \n`,I,P,FP);
}\]

\[
\text{if abs(FP) < 1.0e-20 or C < TOL then}
\]

procedure completed successfully

\[
\text{printf(`\nThe approximate solution is %a`,args[6]);}
\]

\[
\text{printf(`\nwith f(%a`,args[6]);}
\]

\[
\text{printf(` = %11.8f \n`,P);
}\]

\[
\text{printf(`root:=P;}
\]

\[
\text{OK:=FALSE;}
\]

else

STEP 5

\[
I := I+1;
\]

STEP 6

compute $a_i$ and $b_i$

\[
\text{if FA*FP > 0 then}
\]

\[
A := P;
\]

\[
FA := FP;
\]

\[
\text{else}
\]

\[
B := P;
\]

\[
FB := FP;
\]

\[
\text{end if;}
\]

\[
\text{end if;}
\]

\[
\text{end do;}
\]

\[
\text{if OK = TRUE then}
\]

STEP 7

procedure completed unsuccessfully

\[
\text{printf(`\nIteration number %3d`,no);
}\]

\[
\text{printf(`\ngave approximation %12.8f \n`,P);
}\]

\[
\text{printf(`F(P) = %12.8f not within tolerance : %15.8e\n`,FP,TOL);
}\]

\[
\text{RETURN();}
\]

\[
\text{else}
\]

\[
P;
\]

\[
\text{end if;}
\]

\[
\text{end proc;}
\]

> mypack[bisection_dir]:=proc()
> printf(`bisection returns a root of the given function.\n\n`);
> printf(`The arguments for bisection are:\n`);
> printf(`(1)function expression in x\n`);
> printf(`(2)left end point\n`);
> printf(`(3)right end point\n`);
> printf(`(4)tolerance\n`);
> printf(`(5)maximum number of iterations\n`);
> printf(`(6)variable for returning root.\n`);
> printf(`If assigning the result to a variable, have the\n`);
> printf(`variable and the 6th argument the same.\n`);
> printf(`(If r is the variable for returning the root\`);
> printf(`and has already been given a value,\`);
> printf(`the procedure should be preceded by the statement:\`);
> printf(`r:=\`r\`);`
> end;

Next we save the procedures in the package mypack in the library mylib. The command savlibname tells Maple in which library to save the package containing our procedures.
The command \texttt{savelib} is then used to save the package into the library at that location.

\begin{verbatim}
> savelibname:="/mylib";
\end{verbatim}

Now we check to see that the procedures are really there and load them.

\begin{verbatim}
> restart;
> libname:="/mylib",libname;
> with(mypack);
\end{verbatim}

Notice that the two new procedures have been added to the library. Suppose we now want to add two new procedures, \texttt{chop} and \texttt{chop\_dir}, to our library. We create these procedures.

\begin{verbatim}
> mypack[chop]:=proc(x::numeric,t::posint,answer::name)
| local e, x2;
| if x=0 then x2:=0;
| else
| e:=trunc(evalf(log10(abs(x))));
| if abs(x)>1 then e:=e+1 fi;
| x2:=evalf(trunc(x*10^\((t-e))*10^(e-t)))
| fi;
| printf(`\n%a`,args[3]);
| printf(` = %11.8f 
`,x2);
| answer:=x2;
| x2;
| end;

> mypack[chop\_dir]:=proc()
| printf(`chop reduces a number to the specified number of digits.\n\n`);
| printf(`The arguments for chop are:\n`);
| printf(`(1)an integer, fraction, or floating point number, (2)the\n`);
| printf(`number of digits to chop to, (3)variable for returning\`);
| printf(`answer.\n`);
| printf(`If assigning the result to a variable, have the\n`);
| printf(`variable and the 3rd argument the same.\n`);
| printf(`If r is the variable for returning the answer and has\`);
| printf(`already been given a value, the procedure should be preceded\`);
| printf(`by the statement:\n`);
| printf(`r:='r'\`);\n| end;
\end{verbatim}

We add these to our library by proceeding as before.

\begin{verbatim}
> savelibname:="/mylib";
> savelib(mypack);
\end{verbatim}

Now we check to see that all of the procedures are really there and load them.

\begin{verbatim}
> restart;
> libname:="/mylib",libname;
> with(mypack);
\end{verbatim}

We now test our procedures.

\begin{verbatim}
> bisection\_dir();
> r:='r';
> bisection(cos(x),0.5,3.0,.0000000001,100,r);
> chop\_dir();
> r:='r';
> r:=chop(-151/13,5,r);
> r;
\end{verbatim}