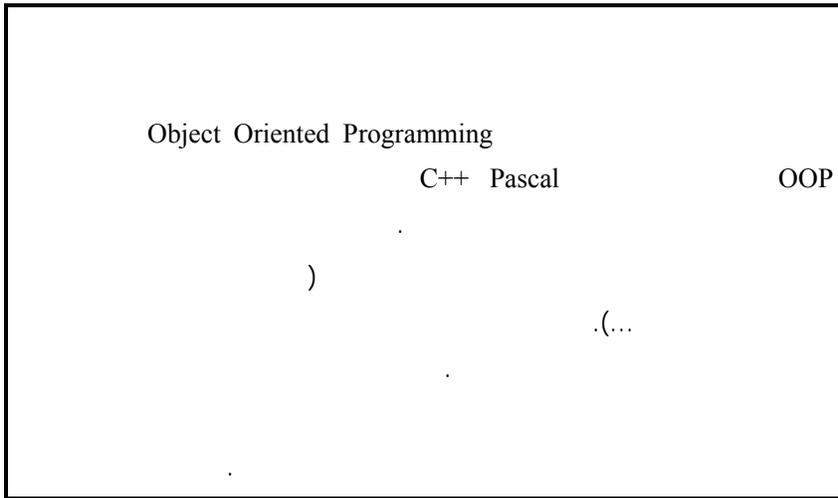


(OOP)



: -1

(C)
()

(Structured Programming)

.OOP (Object Oriented Programming)

: -2

: -1-2

abstract modular
.detail hiding data abstraction

: -2-2

Functions record :Encapsulation -
Procedures
Object
Object :Inheritance -
object
Hierarchy
()
:Polymorphism -
()

[8] [7] [6] [5]

)
Pascal , Visual C +) (Compilers) (C++
(Visual Delphi + ,

-
-
-
-
-

...

OOP
C++

: - 3

:1-3

:

:

...

()

:

:

:

:

1

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:

:

:

...

:

-2-3

[1] Graph Theory

.L X
:

	X`	-5
:	.(....)	-6
	.	▪
	.	▪
	.	▪
	.	▪
	.	▪
	.	▪
	.	▪
	.(....)	-7
	.	-8
	.	-9
	.	-10
	.	-11
	.	-12
	.	-13
	.	-14
	.	-15
	.	-16
	.	-17
	.(....)	-18
	:	

(OOP)

.() 1
.() 0

:(O OP) -4

O O P

(Objectes)

.(2-2-3 1-2-3) ,

:

:

-

-1

Node = Object

IndexNode : Integer;

XPos : Real;

YPos : Real;

NodesVolt : Real;

RE_POWER : Real;

IM_POWER : Real;

Procedure Init (InitIndex Node, Init XPos, Init Y Pos, Init Node Volt, Init
Re_Power, InitIm_Power: Real);

End;

-2

EditNodes = Object(Node);

Procedure Init (InitIndex Node, Init X Pos, Init Y Pos, Init Node Volt, Init
Re_Power, InitIm_Power: Real);

Procedure InsertNewNode;

Procedure ModefyNode;

Procedure DeleteNode;

End;

```

Node
Init
EditNodes
:Init
:InsertNewNode
:ModofyNode
>DeleteNode
:
-
-1

```

```

Branche = Object(Node)
Index Branch :Integer;
Nr Beginning Node : Integer;
Nr Ending Node : Integen;
Kind Element : String[30];
Steel Element : String[40];
Namely Voltage : Real;
Namely Current : Real;
Wrong Volt Current: Real;
Resistance : Real;
Reactance : Real;

```

```
Length : Real;
Section : Real;
Namely power : Real;
CuRealPowerLoses : Real;
FeRealPowerLoses : Real;
ImPowerLosses :Real;
Capacity : Real;
CaseElement : Integer;
Procedure Init (InitIndex Branch, Init Nr Beginning Node, Init Nr Ending Node:
Integer; Initind Element, Init Steel Element: String[40]; Init
Namely Voltage, Init Namely Current, Init Wrong Volt Current,
Init Resistance, Init Reactance, Init Section, Init Namelypower,
Init Cu Real PowerLoses, Init Fe Real Power Loses, Init Im
Power Losses, Init Capacity: Real; Init Case Element: Integer);
End;
```

-2

```
EditBranchess = Object(Branche);
Procedure Init (InitIndex Branch, Init Nr Beginning Node, Init Nr Ending Node:
Integer; Initind Element, Init Steel Element: String [40]; Init
Namely Voltage, Init Namely Current, Init Wrong Volt Current,
Init Resistance, Init Reactance, Init Section, Init Namelypower,
Init Cu Real PowerLoses, Init Fe Real Power Loses, InitIm
Power Losses, Init Capacity: Real; Init Case Element: Integer);
Procedure InsertNewBranche;
Procedure ModefyBranche;
Procedure DeleteBranche;
End;

(Branche)
nit I

Node
(Branche)
(Node)
```

```

        .(          ) Branche      EditBranches
                                :
                                :Init      ■
                                .
                                :InsertNew Branche      ■
                                .(          )
                                :Modefy Branche      ■
                                .(          )
                                :Delete Branche      ■
                                .(

```

: -5

. [2] [3] [4]

.(Visual Pascal)

: -6

(1)

(2) (1)
(2-3)

(...)

...

(1) 1

1	2	3	4	5	6	7
1	1	0	0	240	0	0
2	2	0	0	238	125	0
3	3	0	0	238	251	0
4	4	0	0	238	-45	-28
5	5	0	0	238	-19	-12
6	6	0	0	238	-63	-40
7	7	0	0	238	-25	-16
8	8	0	0	238	-42	-26
9	9	0	0	238	0	0
10	10	0	0	238	-18	-11
11	11	0	0	238	-60	-37
12	12	0	0	238	+35	+22
13	13	0	0	238	-44	-27
14	14	0	0	238	-10	-6
15	15	0	0	238	-31	-19
16	16	0	0	238	-33	-20
17	17	0	0	238	-35	-33
18	18	0	0	238	-30	-19
19	19	0	0	238	-39	-24
20	20	0	0	238	-9	-6
21	21	0	0	238	-13	-8

22	22	0	0	238	-27	-17
23	23	0	0	238	-22	-14
24	24	0	0	238	-24	-15
25	25	0	0	238	+24	+26
26	26	0	0	238	-12	-10

:

- . -1
- . -2
- .[M] () X -3
- .[M] () Y -4
- .[Kv] -5
- .[Mw] -6
- .[Mvar] -7

(1)

2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	4	24	25	0	230	0	0	0.0842804	0.4214022	135.5	400	0	0	0	0	0	1
2	4	24	23	0	230	0	0	0.0846153	0.4230769	130	400	0	0	0	0	0	1
3	4	24	22	0	230	0	0	0.0843078	0.4003397	167.6	400	0	0	0	0	0	1
4	4	22	23	0	230	0	0	0.0843356	0.4216783	143	400	0	0	0	0	0	1
5	4	22	1	0	230	0	0	0.0844054	0.4210626	51.3	400	0	0	0	0	0	1
6	4	21	20	0	230	0	0	0.0438596	0.0223684	11.4	400	0	0	0	0	0	1
7	4	20	1	0	230	0	0	0.0842657	0.4219114	85.8	400	0	0	0	0	0	1
8	4	20	18	0	230	0	0	0.0842812	0.4219234	96.7	400	0	0	0	0	0	1
9	4	18	19	0	230	0	0	0.0289855	0.1437198	41.4	400	0	0	0	0	0	1
10	4	18	17	0	230	0	0	0.0838323	0.4215568	16.7	400	0	0	0	0	0	1
11	4	17	1	0	230	0	0	0.0841487	0.4217221	153.3	400	0	0	0	0	0	1
12	4	17	16	0	230	0	0	0.0851106	0.4259557	49.7	400	0	0	0	0	0	1
13	4	17	4	0	230	0	0	0.0808114	0.4574811	118.3	400	0	0	0	0	0	1
14	4	4	2	0	230	0	0	0.0843243	0.4216216	18.5	400	0	0	0	0	0	1
15	4	4	1	0	230	0	0	0.0846361	0.4226415	185.5	400	0	0	0	0	0	1
16	4	1	5	0	230	0	0	0.0842	0.421	225.2	400	0	0	0	0	0	1
17	4	16	15	0	230	0	0	0.0842826	0.4214133	107.97	400	0	0	0	0	0	1
18	4	15	3	0	230	0	0	0.084	0.4202	49.5	400	0	0	0	0	0	1
19	4	4	26	0	230	0	0	0.08433	0.41666	2.4	400	0	0	0	0	0	1
20	4	4	5	0	230	0	0	0.085299	0.426497	55.1	400	0	0	0	0	0	1
21	4	4	12	0	230	0	0	0.0810426	0.406	63.3	400	0	0	0	0	0	1
22	4	3	13	0	230	0	0	0.0504	0.2023	36.5	240	0	0	0	0	0	1
23	4	13	14	0	230	0	0	0.007105	0.03605	38	400	0	0	0	0	0	1
24	4	13	12	0	230	0	0	0.0843112	0.421683	78.4	400	0	0	0	0	0	1
25	4	12	5	0	230	0	0	0.082125	0.42174	20.7	400	0	0	0	0	0	1

(OOP)

26	4	5	6	0	230	0	0	0.08428	0.42134	135.26	400	0	0	0	0	0	1
27	4	12	11	0	230	0	0	0.08061	0.40596	137.7	400	0	0	0	0	0	1
28	4	11	10	0	230	0	0	0.05185	0.214	2.7	240	0	0	0	0	0	1
29	4	11	7	0	230	0	0	0.084058	0.4274	13.8	400	0	0	0	0	0	1
30	4	7	6	0	230	0	0	0.084558	0.42174	34.5	400	0	0	0	0	0	1
31	4	7	8	0	230	0	0	0.0843	0.4217	71.4	400	0	0	0	0	0	1
32	4	8	9	0	230	0	0	0.08439	0.421933	53.8	400	0	0	0	0	0	1

- : -1
- . (...) -2
- . -3
- . (...) -4
- . (...) -5
- . [kv] -6
- . [A] -7
- . [kv] [A] -8
- . [Ohm/Km] R -9
- . [Ohm/Km] X -10
- . [km] -11
- . [mm2] -12
- . [Mw] -13
- . [Mw] -14
- . [Mw] -15
- . [Mvar] -16
- . [MicroFarad] -17
- . -18

3 4 3

: 4

3

1	2	3	4	5
1	240	0	155.14	80.24656
2	237.97365	+0.71076525	125	22.38209
3	237.98951	+4.629236	251	26.085086
4	237.21335	+0.22848592	-45	-28
5	236.81041	-0.3212995	-10	-12
6	220.17038	-5.385244	-63	-40
7	218.76415	-5.8609536	-25	-16
8	215.39653	-7.3278556	-42	-26
9	215.70313	-7.3610792	0	0
10	219.18968	-5.6205254	-18	-11
12	236.20072	+0.57431957	+35	+22
13	236.61595	+3.5009811	-44	-27
14	236.56913	+3.4837921	-10	-6
15	235.04851	+2.5367505	-13	-19
16	232.0.2589	+0.7120671	-33	-20
17	232.24709	-1.540682	-53	-33
18	231.38815	-1.8763213	-30	-19
19	230.59591	-2.0995362	-39	-24
20	234.78977	-1.1133485	-9	-6
21	231.79302	-1.1202232	-13	-8
22	240.62527	-0.48230014	-27	-17
23	241.87121	-1.2597923	-22	-14
24	242.5	-0.70801715	-24	-15
25	242.5	+1.2199923	+42	+26
26	237.1609	+0.21481515	-12	-103

:

-1

.[Kv]

-2

.[Kv]

-3

-4

.[Mvar]

-5

1	1	22	40.628740	-23.768382
2	1	20	35.768954	21.275675
3	1	17	27.865328	12.067391
4	1	4	-1.140594	-5.141582
5	1	5	52.014672	75.813460
6	2	4	126.377540	22.070152
7	3	15	100.477160	11.686187
8	3	13	151.806290	14.011696
9	4	17	38.874504	8.361211
10	4	2	-126.150470	-22.291047
11	4	1	1.161888	-22.243676
12	4	26	15.299452	9.208482
13	4	5	22.857768	-4.471726
14	4	12	8.055329	2.934108
15	5	1	-51.750541	-77.552213
16	5	4	-22.814114	-3.451265
17	5	12	-37.500969	22.688405
18	5	6	94.024762	46.641426
19	6	5	-91.662965	-52.611266
20	6	7	30.033862	13.231052
21	7	11	-33.776334	-9.382128
22	7	6	-29.965705	-17.205075
23	7	8	42.319949	12.055812
24	8	7	-42.060446	-19.496363
25	8	9	0.545366	-6.259356
26	9	8	-0.544446	-0.227833
27	10	11	18.915292	2.169462
28	11	12	-99.685720	-51.391146
29	11	10	-18.914235	-2.331838
30	11	7	33.805748	7.811235
31	12	4	-8.043940	-12.464743
32	12	13	-97.379261	13.864866
33	12	5	37.563124	-25.385896
34	12	11	102.398680	45.762162
35	13	3	-151.197990	-13.541147
36	13	14	13.206623	5.291114
37	13	12	98.547996	-19.390120
38	14	13	-13.205622	-5.053986
39	15	16	68.619807	-3.925513

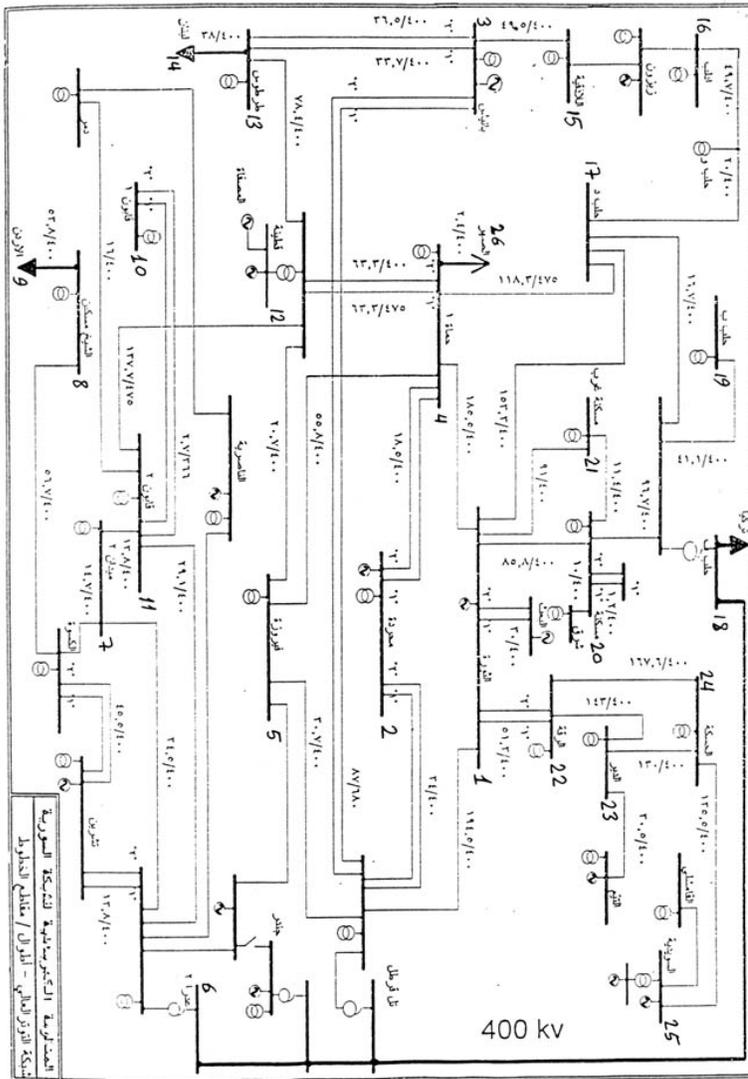
(OOP)

:

40	15	3	-99.718423	-15.070239
41	16	17	34.956955	-12.642005
42	17	18	48.384278	17.675185
43	17	1	-27.567408	-32.775493
44	17	16	-34.854389	6.129564
45	17	4	-38.566630	-24.414919
46	18	20	-20.710082	-21.759687
47	18	19	39.473787	21.935344
48	18	17	-48.314298	-19.654114
49	19	18	-39.427094	-23.657738
50	20	21	24.395351	-7.816072
51	20	1	-35.512099	-32.548254
52	20	18	20.809789	8.614094
53	21	20	-24.394756	7.733200
54	22	24	1.900853	-19.357595
55	22	23	11.647896	-17.962896
56	22	1	-40.548751	20.320485
57	23	24	-10.391198	-10.456378
58	23	22	-11.608801	-3.453618
59	24	25	-33.196761	-3.123817
60	24	23	10.411577	-9.220933
61	24	22	-1.888839	-5.986437
62	25	24	33.420900	-16.447348
63	26	4	-15.298307	-9.553401

:

- . -1
- . -2
- . -3
- .[Mw] -4
- .[Mvar] -5



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1

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-7

.1991

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-8

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Object Oriented Programming And Electrical Power System Simulation

Abstract

Application Of Object Oriented Programming OOP concept and the C++ Pascal programming language to power system simulation has been explored. An efficient platform for power system simulation applications has been proposed. By emulating a physical power lap, a generic power network container has been build, a module. One load flow applications a ac load flow have been discussed. It is found that the OOP based Pascal load flow programs are as efficient as their non – OOP counterparts.