?

Scipy

pyOpt

$\min f(x)$
x_k
x_{k+1}**?**

??
A
B
C
A
$r_{0,1}$
$r_{0,3}$
0
B
s_3
$r_{0,3}$
$r_{3,2}$
C
$_h idden/.style =$
$verythick, dashed, polygon/.style =$
$verythick, black, axis/.style =$
$-, blue, thick, point/.style =$
$verythick, black]$
$r_{0,3}$
$r_{0,1}$
$r_{3,0}$
s_3
•B
•A
•C
?
A
B
C
C
-1
N_s
N_s
?
algorithm related optimization solver related
•N_s
•n_{knots}
•T_p
•T_c
•
•
??
•t_0
T_c
•$_1$
N_{knots}
$O(n^3)$
n
T_c
first
inter
last
$MAXIT_{first}$
$MAXIT_{inter}$
$MAXIT_{last}$
10^{-3}
maximum computational time
2
T_c
maximum computational timeT_c
??
N_s
N_{knots}
maximum computational timeT_c
T_c/T_p
N_s
maximum computational

N_s
N_{knots}
N_{knots}
N_s
max-
i-
mum
com-
pu-
ta-
tional
time T_c
$_{3_{N}knots_4/mcttc-tctp.eps}$ *Fourinternalknots.Averagevariancebetweenlinesis* $\times 10^{-2}$
$_{3_{N}knots_5/mcttc-tctp.eps}$ *Fiveinternalknots.Averagevariancebetweenlinesis* $\times 10^{-2}$
$_{3_{N}knots_6/mcttc-tctp.eps}$ *Sixinternalknots.Averagevariancebetweenlinesis* $\times 10^{-2}$
??
??
T_p
T_c
N_s
N_{knots}
v_{max} 1.00m/s
ω_{max} 5.00rad/s
q_{inital} $[-0.050.00\pi/2]^T$
q_{final} $[0.107.00\pi/2]^T$
u_{final} $[0.000.00]^T$
u_{final} $[0.000.00]^T$
O_0 [0.551.910.31]
O_1 [−0.083.650.32]
O_2 [0.384.650.16]
$_{r}esults/p_{30}.48_2.4_11_{40}.001_15_40_20_5.0_0.1_3.0_0.5_1.0_10.0/multirobot-$
path.pngRobot′spath.
$_{r}esults/p_{30}.48_2.4_11_{40}.001_15_40_20_5.0_0.1_3.0_0.5_1.0_10.0/multirobot-$
vw.pngRobot′sinput.
max-
i-
mum
com-
pu-
t-
tional
time
T_c
$7.57s$

$_{6_{Nk}nots_4/mcttc-tctp.eps}Fourinternalknots.Averagevariancebetweenlinesis\times10^{-2}$
$_{6_{Nk}nots_5/mcttc-tctp.eps}Fiveinternalknots.Averagevariancebetweenlinesis\times10^{-2}$
$_{6_{Nk}nots_6/mcttc-tctp.eps}Sixinternalknots.Averagevariancebetweenlinesis\times10^{-2}$
T_p
T_c
N_s
N_{knots}
v_{max} 1.00m/s
ω_{max} 5.00rad/s
q_{inital} $[-0.050.00\pi/2]^T$
q_{final} $[0.107.00\pi/2]^T$
u_{final} $[0.000.00]^T$
u_{final} $[0.000.00]^T$
O_0 $[-0.351.360.39]$
O_1 $[0.212.530.33]$
O_2 $[-0.324.860.23]$
O_3 $[0.103.980.31]$
O_4 $[0.621.250.18]$
O_5 $[1.173.660.25]$
$_{r}esults/p_{61}.28_3.2_12_{60}.001_15_40_20_5.0_0.1_3.0_0.5_1.0_10.0/multirobot-path.pngRobot's path.$
$_{r}esults/p_{61}.28_3.2_12_{60}.001_15_40_20_5.0_0.1_3.0_0.5_1.0_10.0/multirobot-vw.pngRobot's input.$
max-imum com-pu-ta-tional time
T_c
7.76s
$O(n^3)$
$O(n^3)$
n

??
T_c
T_p
N_s
$3_{Nk}nots_6/tot10.epss$ =
10
$3_{Nk}nots_6/tot11.epss$ =
11
$3_{Nk}nots_6/tot12.epss$ =
12
T_c
T_p
N_s
N_s
T_c