Supplementary Pages for "Automatic design of Hybrid Stochastic Local Search algorithms for permutation flowshop problems"

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1. Algorithms outline and parameters

1.1. PFSP: Makespan

In the following there is the outline of IG_{all} and IG_{irms} (Algorithms 1 and 2) with the numerical parameters reported in Table 1.

Algorithm 1 IG_{all}

Output The best solution found π^*,
π := $FRB5()$;
π := $\mathsf{II}(\pi, local\ minima, tainsert)$;
π^* := π
while ! time is over **do**
    π' := $\mathsf{IG}_{tb+lsps}(\pi, ls(first, local\ minima, tainsert))$;
    π' := $\mathsf{II}(\pi', first, local\ minima, tainsert)$;
    π := $rsacc(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        π^* := π'
    end if
end while
Return π^*

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Algorithm 2 IG_{irms}

Output The best solution found π^*,
π := $FRB5()$;
π := $\mathsf{II}(\pi, maxstepsorlocmin(s), tainsert)$;
π^* := π
while ! time is over **do**
    π' := $\mathsf{IG}_{lsps}(\pi, ls(best, local\ minima, tainsert))$;
    π' := $\mathsf{II}(\pi', first, maxstepsorlocmin, tainsert)$;
    π := $psa(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        π^* := π'
    end if
end while
Return π^*

	Component	Parameter	Value
IG_{all}			
	$IG_{tb+lsps}$	d	2
	$rsacc$	T_{rs}	0.7
IG_{irms}			
	$maxstepsorlocmin$	$maxi$	77
	IG_{lsps}	d	1
	psa	T_s	4.6512
		T_e	0.9837
		β	0.0234
		it	324

Table 1: Parameters setting for IG_{all} and IG_{irms}

1.2. PFSP: Flowtime

In the following there is the outline of IGA and ALG_{irtct} (Algorithms 3, 4 and 5) with the numerical parameters reported in Table 2.

Algorithm 3 IGA

Output The best solution found π^*,
π := $\mathit{LR}(n/m)$;
π := $\mathit{iRZ}(\pi)$;
π^* := π
while ! time is over **do**
    π' := $\mathit{IG}(\pi)$;
    π' := $\mathit{iRZ}(\pi')$;
    π := $\mathit{rsacc}(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        π^* := π'
    end if
end while
Return π^*

Algorithm 4 ALG_{irtct}

Output The best solution found π^*,
π := $\mathit{NRZ}_2()$;
π := ALGirtct2(π);
π^* := π
while ! time is over **do**
    π' := $\mathit{IG}_{io}(\pi)$;
    π' := ALGirtct2(π');
    π := $\mathit{psa}(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        π^* := π'
    end if
end while
return π^*

Algorithm 5 ALG_{irtct2}

input current solution π
output the best solution found π^*,
$\pi := \mathsf{ii}(\pi, first, local\ minima, insert)$;
$\pi^* := \pi$
while $maxsteps()$ **do**
    $\pi' := random\ move(\pi, transpose)$;
    $\pi' := \mathsf{ii}(\pi', first, local\ minima, insert)$;
    $\pi := psa(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        $\pi^* := \pi'$
    end if
end while
return π^*

	Component	Parameter	Value
IGA			
	IG	d	8
	$rsacc$	T_{rs}	2.0
ALG_{irtct}			
	IG_{io}	d	11
	sa	t_s	1.0448
		t_e	0.8470
		β	0.0944
		it	423
		α	0.9555
ALG_{irtct2}			
	$maxsteps$	$maxi$	173
	$random\ move$	num	8
	psa	t_s	4.9498
		t_e	0.0339
		β	0.0944
		it	349

Table 2: Parameters setting for IGA and ALG_{irtct}

1.3. PFSP: Total tardiness

In the following there is the outline of TSM63, IG_{RLS} and ALG_{irtct} (Algorithms 6, 7, 4 and 5) with the numerical parameters reported in Table 4.

Algorithm 6 TSM63

Output The best solution found π^*,
$\pi := \mathit{NEH}_{edd}()$;
$\pi := \mathsf{CH6}(\pi)$;
$\pi^* := \pi$
while ! time is over **do**
    $\pi' := \mathit{CP3}(\pi)$;
    $\pi' := \mathsf{CH6}(\pi')$;
    $\pi := \pi'$;
    if $f(\pi') < f(\pi^*)$ **then**
        $\pi^* := \pi'$
    end if
end while
Return π^*

Algorithm 7 IG_{RLS}

Output The best solution found π^*,
$\pi := \mathit{NEH}_{edd}()$;
$\pi := \mathsf{II}(\pi, first, local\ minima, karneigh)$;
$\pi^* := \pi$
while ! time is over **do**
    $\pi' := \mathit{IG}(\pi)$;
    $\pi' := \mathsf{II}(\pi, first, local\ minima, karneigh)$;
    $\pi := \mathit{karacc}(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        $\pi^* := \pi'$
    end if
end while
Return π^*

Algorithm 8 ALGirtt

Output The best solution found π^*,
π := $NEH_{edd}()$;
π := ALGirtt2(π);
π^* := π
while ! time is over **do**
    π' := $CP3(\pi)$;
    π' := ALGirtt2(π');
    π := π';
    if $f(\pi') < f(\pi^*)$ **then**
        π^* := π'
    end if
end while
Return π^*

Algorithm 9 ALGirtt2

Input Current solution π
Output The best solution found π^*,
π := II($\pi, first, local\ minima, insert$);
π^* := π
while $maxsteps()$ **do**
    π' := $random\ move(\pi, transpose)$;
    π' := II($\pi', first, local\ minima, insert$);
    π := $rsacc(\pi, \pi')$;
    if $f(\pi') < f(\pi^*)$ **then**
        π^* := π'
    end if
end while
Return π^*

	Component	Parameter	Value
TSM63			
	CP3	d	3
		ω	30
		pc	0.2
IG_{RLS}			
	IG	d	8
	$rsacc$	T_{rs}	2.0
ALG_{irtt}			
	CP3	d	2
		ω	29
		pc	0.7955
ALG_{irtt2}			
	maxsteps	*maxi*	39
	random move	*num*	7
	rsacc	T_{rs}	0.5203

Table 3: Parameters setting for TSM63, IG_{RLS} and ALG_{irtt}

References

[1] Q.-K. Pan, R. Ruiz, Local search methods for the flowshop scheduling problem with flowtime minimization, European Journal of Operational Research 222 (1) (2012) 31–43.