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Generalized net model of the coordinating and controlling after flight servicing of aeronautical means

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Abstract: A generalized net is used to construct a model which describes the process of coordinating and controlling after flight servicing of aeronautical means.

Keywords: Generalized nets, modelling, after flight servicing.

1. Introduction

The paper models the process of changing of coordinating and controlling after flight servicing of aeronautical means. For the purpose we use Generalized Nets (GNs) [1, 2]. In [3] was constructed the GN model of an activity of air-traffic control center.

The airports are complex technology entities with important functions upon battening the aeronautics and the flight safety. According to the regulation on the civil aviation the civil airports are a state property and are: civil airports servicing international and domestic flights, for service flights for aviation as well other services against payment.

There are two types of infrastructural taxes in the civil aviation – tax for civil use and tax for aeronavigational services.

Fees for landing of an aircraft on airport - they are calculated based on the main hikers weight of the given aircraft, as each region with note of weight rounds up itself to entire tone. In the charge are included: keeping the airfield and the infrastructure development of the airfield; restricting as well as removing the obstacles; maintaining the visual signals; emergency - the rescue anti-fire indemnity to the flights on the territory of the airport and in its region; airport security; flight security; managing the motion of the territory of the airport; coordination between the different departments and the enterprises with the connection with using the airport; equipping and installing electrical network; the reduction in the formalities in the airport; the stay of the aircrafts for passenger transportation and mail for up to 3 hours, to the aircrafts for cargoes transportation up to 6 hours; the administrative fees.

Fees for parking (a park) Includes the costs for the stay and usage of landing and stopping place of an aircraft and the security staff as well.

The fees travel services of the passengers which flight begins with from the airport. Includes the use by the passengers of its general lounges and the other servicing facilities, assured with the called for facilities, On In the region of the airfield, eking special facilities at safety, of skilled personnel of doubts of safety as well, extending the opportunity for using against the various wage mail, telegraph, shops, institutions, banks and etc.

2. GN model

The constructed GN-model describes the way to organize, coordinate and control the after flight servicing of the aircraft, and the organization of the activities of ramp agent services and load control.

The GN-model (see Figure. 1) contains 6 transitions and 16 places.

Initially in places a_4, a_8 and a_{10} stay the next α-tokens:

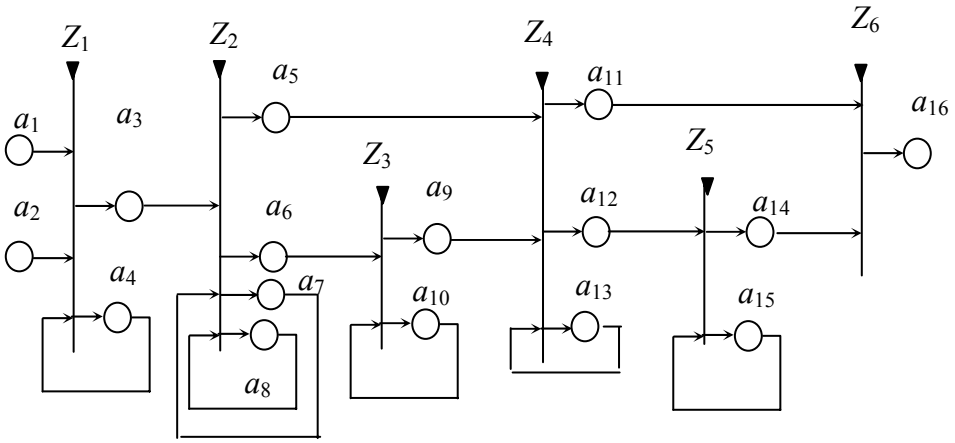

Fig. 1 GN-Model of coordinating and controlling after flight servicing of aeronautical means

- in place a_4 – α_4-token with characteristic
  "Current leader shift RALC, current schedule of landed aircraft";
- in place a_8 – α_8-token with characteristic
  "Current technological schedule of the airport";
- in place a_{10} – α_{10}-token with characteristic
  "Book of standing instructions of the structural damages".

These tokens will be in their own places during the whole time during which the GN functions.

The forms of the transitions are the following.

The information for the exact time of landing of the aircrafts enters the generalized net constantly via place a_0 with initial characteristic

"Information from the radio station for the exact time of landing of the aircraft j", for $j = 1, 2, ..., m$.

The controllers SWPU and leader shift RALC work in shifts. The information for the new shift enters the generalized net via place a_1 with initial characteristic

"Leader shift RALC, Controller SWPU 1, controller SWPU 2,…, controller SWPU n".

Controllers SWPU take the switch and meeting together with the ongoing schedule.

$$Z_1 = <\{a_0, a_1, a_4\}, \{a_2, a_3, a_4\}, r_1, \vee (a_0, a_1, a_4)>,$$

where:

$$r_1 = \begin{array}{c|ccc} & a_2 & a_3 & a_4 \\ \hline a_0 & false & true & true \\ a_1 & false & false & true \\ a_4 & W_{4,2} & false & true \end{array},$$

$W_{4,2}$ = "There is an information for landing of the aircraft".

The tokens entering place a_2 obtain characteristics

"Controller SWPU i, information for the exact time of landing of aircraft j",

for $i = 1, 2, ..., n, j = 1, 2, ..., m$.

The token entering place a_3 do not obtain new characteristic.

The transition Z_2 describes the positioning of the officially vehicle on the fixed place.

$$Z_2 = <\{a_2, a_3, a_7, a_8\}, \{a_5, a_6, a_7, a_8\}, r_2, \vee(a_2, a_3, a_7, a_8)>$$

$r_2 =$

	a_5	a_6	a_7	a_8
a_2	*fasle*	*fasle*	*true*	*fasle*
a_3	*fasle*	*fasle*	*fasle*	*true*
a_7	$W_{7,5}$	$W_{7,6}$	*fasle*	*fasle*
a_8	*false*	*false*	*false*	*true*

,

$W_{7,5}$ = "There are no structural damages on the aircraft",

$W_{7,6} = \neg W_{7,5}$.

The tokens entering places a_5 and a_6 obtain characteristics respectively:

"Controller SWPU i, aircraft j" and

"Controller SWPU i, aircraft j, information for structural damages on the aircraft",

for $i = 1, 2, ..., n, j = 1, 2, ..., m$.

If while positioning the officially vehicle are caused any structural damages follows transition Z_3.

$$Z_3 = <\{a_6, a_{10}\}, \{a_9, a_{10}\}, r_3, \vee (a_6, a_{10})>$$

$r_3 =$

	a_9	a_{10}
a_6	*false*	*true*
a_{10}	$W_{10,9}$	*true*

$W_{10,9}$ ="The procedure for damaged aircraft was completed".

The tokens entering place a_9 obtains characteristic

"Controller SWPU i, aircraft j, protocol for damages".

Damages are the result of wrong approach prepare the needed protocols for damages and begin procedures for damaged aircraft, continue the servicing of the aircraft

Transition Z_4 describes the process of the supervision and positioning of Aircraft-Service Technique (AST).

$$Z_4 = <\{a_5, a_9, a_{13}\}, \{a_{11}, a_{12}, a_{13}\}, r_4, \vee (a_5, a_9, a_{13})>$$

$r_4 =$

	a_{11}	a_{12}	a_{13}
a_5	*false*	*false*	*true*
a_9	*false*	*false*	*true*
a_{13}	$W_{13,11}$	$W_{13,12}$	*false*

$W_{13,11}$ = "There are no structural damages on the aircraft",

$W_{13,12} = \neg W_{13,11}$.

The tokens entering places a_{11} and a_{12} obtain characteristics respectively:

"Controller SWPU i, aircraft j" and

"Controller SWPU i, aircraft j, information for structural damages on the aircraft",

for $i = 1, 2, ..., n, j = 1, 2, ..., m$.

If while positioning AST are done any damages follows transition:

$$Z_5 = <\{a_{12}, a_{15}\}, \{a_{14}, a_{15}\}, r_5, \vee (a_{12}, a_{15})>$$

r_5	a_{14}	a_{15}
a_{12}	*false*	*true*
a_{15}	$W_{15,14}$	*true*

$W_{15,14}$ ="The procedure for damaged aircraft was completed".

The tokens entering place a_{14} obtains characteristic

"Controller SWPU *i*, aircraft *j*, protocol for damages".

Damages are the result of wrong approach prepare the needed protocols for damages of the positioning of the AST around the aircraft

The last transition is information exchange with the aircraft crew:

$$Z_6 = <\{a_{11}, a_{14}\}, \{a_{16}\}, r_6, \vee(a_{11}, a_{14})>$$

r_6	a_{16}
a_{11}	*True*
a_{14}	*True*

The tokens entering place a_{16} obtains characteristic

"Information for the crew of the aircraft".

Establish contact with the crew of the aircraft: determine the fuel data, loadsheet, baggage placement, catering, duty free trade etc.

3. Conclusion

The constructed GN-model allows analyzing the coordinating and controlling after flight servicing. It can be used for simulation and optimization the process.

References

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