ROYALTY-FREE SOFTWARE LICENCE

RARL 2

BETWEEN:

Institut national de recherche en informatique et en automatique

A National institute for research in computer science and control
Public corporation of a scientific and technological nature, governed by the French decree Nr 85-831 of the 2d August 1985 modified.
Having its registered office at: Domaine de Voluceau – Rocquencourt - BP 105 - 78 153 LE CHESNAY - FRANCE
Represented by its Chairman and Managing Director, Bruno Sportisse, and by Mr David Simplot, Director of the Inria Sophia Antipolis-Méditerranée research centre, located at 2004, routes des lucioles – BP 93 – 06902 Sophia Antipolis Cedex, France, who is acting on due authority for the purposes of this agreement.

Referred to hereinafter as "Inria"

And

Association pour la Recherche et le Développement des Méthodes et Processus Industriels

Declared under the law of 1st july1901
Having its registered office at: 60, Boulevard Saint-Michel 75272 Paris cedex 06,
Represented by Mrs Patricia Renaud, Director
Acting on behalf Centre de Mathématiques Appliquées common research centre ARMINES and Mines ParisTech.

Referred to hereinafter as "ARMINES".

Inria and ARMINES referred to hereinafter 'the Institutions".

Inria having been mandated by ARMINES to act on its name and on behalf of the RARL2 software.

of the one part,

AND:

Name:

Organized and existing under the laws of

Having its registred office at

Represented by

Referred to hereinafter as "The Beneficiary"

<div align="right">of the other part,</div>

Hereinafter, Inria, ARMINES and the Beneficiary are referred to collectively as the "Parties".

The Technical Managers are:

<u>For the Insitutions</u>: Martine OLIVI
Email: martine.olivi@inria.fr

<u>For the Beneficiary</u>: _____
Email:

WHEREAS:

- The software **"RARL2"** entirely designed and developed by Inria's agents within the FACTAS project team directed by Fabien SEYFERT and by agents of the Centre de Mathémtiques Appliquées de Mines ParisTech (ARMINES).

- Inria and ARMINES hold equally the intellectual property rights over this software.

- The RARL2 software version2.0 dated 2014, December the 17th has been registered with the French Agency of Protection des Programmes under the number IDDN.FR.001.340003.S.P.2002.000.31235.

- A co-ownership agreement about the above-mentioned software has been signed by Inria and ARMINES on the 21st of December 2006, whose provisions allow the co-owners to grant non-exclusive licences to third parties.

- The software's description is mentioned in the technical appendix.

- The Beneficiary wishes to use the software for **academic research purposes only**.

IT IS AGREED AS FOLLOWS:

ARTICLE 1 – DEFINITIONS

When they begin with a capital letter, the terms mentioned below have the following definition

- Software: means the software **"RARL2 v2.0"** as described in the Technical Appendix. The Software includes the matlab executed code and its Technical Documentation, excluding other programs necessary to use the Software, which the Beneficiary will have to obtain by other means.

- Technical Documentation: means the documentation supplied with the code, in electronic format or on hard-copy.

- Use: means the loading of the Software into the memory of a computer belonging to the Beneficiary and processing all or part of the Software data in view of the sequencing and execution of the instructions it contains, in accordance with its functions escribed in the Technical Documentation.
  Any Use in the scope of demonstration or collaboration with third parties is excluded, as well as any commercial usage of the Software.

- User: means any employee of the Beneficiary, or person reporting to the Beneficiary, who has been granted by the Beneficiary, the right to Use the Software in pursuance of the present agreement.

- Error: denotes any incident, anomaly, bug or non-compliance of the Software in relation to the specifications.

ARTICLE 2 – PURPOSE

This agreement (hereinafter the Agreement) is intended to define the rights granted to the Beneficiary by the Institutions under the Software.

ARTICLE 3 – DURATION AND EFFECTIVE DATE

This Agreement shall have a term of **thirty-six (36) months** and take effect on the date of the signature of the Agreement by the last Party. It can be extended by means of an amendment.

ARTICLE 4 – FINANCIAL TERMS

The Agreement is concluded without financial compensation.

ARTICLE 5 – RIGHTS GRANTED - CONDITIONS OF USE

5.1 Rights granted

The Beneficiary is authorised to Use the Software **for academic research purposes only excluding any other usage such as commercial use**.

This license is a royalty free, world-wide, non-exclusive and non-transferable authorization, and shall not in any case be transferred totally or in part to a third party, either in return for remuneration or free-of-charge.

5.2 Condition of use

The license is granted **only for one site whose address is: …………………………………………**

The Software will be exclusively used on the responsibility of the Beneficiary's technical manager named on the cover page, or by any User belonging to the personnel of the Beneficiary or any third party working for and on the site of the Beneficiary who has obtained from the said manager the right to Use the Software in accordance with the stipulations of this Agreement.

The Software must be Used according to the stipulations of this Agreement and in compliance with the Technical Documentation, exclusive of any other uses.

According to the terms and conditions of article L.335-3 of the French Intellectual Property Code, the Beneficiary recognizes that any use not in compliance with the above-mentioned terms and conditions shall constitute a breach of the right to use the Software, and shall represent by this fact an infringement of copyright.

In particular, the Beneficiary is prohibited from carrying out any direct or indirect availability of the Software to any third party, such as sale, rental or lending.

In accordance with the provisions of article 122-5 of the French Intellectual Property Code, the Beneficiary is authorized to make a back-up copy to safeguard Use of the Software**.**

ARTICLE 6 – INTELLECTUAL PROPERTY

The Beneficiary hereby acknowledges that the copyright on the Software is held by Inria / ARMINES and that this Agreement does not entail any transfer of property in his favour.

The Beneficiary will take all reasonably required measures to protect the rights of Inria and ARMINES on the Software. Therefore, the Beneficiary hereby undertakes to retain any copyright notice of the Software and any mention of the names of its authors wherever they may appear.

In case of an attempt to seize the Software the Beneficiary undertakes to inform Inria and ARMINES immediately by registered mail, to raise all formal protests required against the seizure and to take all necessary steps to make known the copyright on the Software.

In the event that the Beneficiary wishes to proceed with the industrialization and the marketing of the Software, it recognizes that these actions require the express and prior

authorization of Inria and ARMINES. Such actions will be stated in a separate agreement between the Parties.

ARTICLE 7 – TECHNICAL MANAGERS

Both the Insitutions and the Beneficiary have appointed a technical manager, as indicated on the cover page of this Agreement, for supervision of the agreement.

Each of the Parties reserves the right to appoint a different technical manager at a later date. When applicable, they shall inform the other Party of this change in writing. This letter shall be sent to the technical manager of the other Party.

ARTICLE 8 – DELIVERY OF THE SOFTWARE

The Institutions undertake to send to the Beneficiary a copy of the Software in the form of matlab executable code.

The Beneficiary undertakes to acknowledge the receipt of the SOFTWARE as follows:

- By registered mail addressed to the address below, within eight (8) days of its delivery by the Institutions.

> Inria Sophia Antipolis-Méditerranée
> Service Administratif et Financier
> Att : Marie Schiaffino et Martine Olivi
> 2004, route des lucioles
> BP 93, 06902 Sophia-Antipolis
> France
>
> Or

- By registered electronic mail, addressed to Inria's technical supervisor designated on the front page (martine.olivi@inria.fr) and to Inria's administrative and financial office manager (marie.schiaffino@inria.fr) within twenty four (24) hours of its delivery by the Institutions.

ARTICLE 9 – BENEFICIARY'S COMMITMENTS

9.1 The Beneficiary hereby undertakes to mention in full the name and origin of the Software in any publications containing results obtained via the Use of the Software.

9.2 The Beneficiary hereby undertakes to indicate to the Institutions any Errors or all other defects in the Software that they observe during Use thereof.

9.3 The Beneficiary hereby undertakes to inform the Institutions of any loss or destruction of the Software and/or its Technical Documentation.

ARTICLE 10 – GUARANTEE - RESPONSIBILITY - MAINTENANCE

10.1 Guarantee: the Software is a research prototype. It is therefore the Beneficiary's responsibility to ensure that its technical characteristics and functions correspond to his needs. As such the Software is provided « as is » without warranty of any kind, express or implied, and more precisely without warranty of fitness for a particular purpose.

The Parties hereby agree that the Institutions are not liable for any guarantee to the Beneficiary with regard to the smooth running of the Software.

10.2 Responsibility: the Parties hereby expressly agree that under no circumstances shall the Institutions be declared responsible for any direct or indirect damage suffered by the Beneficiary resulting from Use of the Software, problems encountered during its use or prevention of its Use.

10.3 Maintenance: The Institutions shall not perform any maintenance for the Software.

ARTICLE 11 – DEFAULT – TERMINATION

If the Beneficiary defaults on the performance of his obligations, in particular defaulting on the obligation to protect the Software, Inria shall be able to terminate this Agreement by right and without legal proceedings.

ARTICLE 12 – DESTRUCTION OF THE SOFTWARE

At the term of the Agreement or in the case where contractual relations are discontinued due to breaches of obligations or termination as described in article 11 above, the Beneficiary agrees to cease all Use of the Software.

The Beneficiary hereby undertakes, within a maximum time period of 15 (fifteen) calendar days with effect from termination of contractual relations, **to destroy the Software as well as the Technical Documentation**, irrespective of the format in which it is held.

Within this time period, the Beneficiary shall send a duly signed certificate documenting the destruction of the Software and any copy in his possession:

- Either by registered mail with acknowledgement of receipt to the address below:
  Inria Sophia Antipolis Méditerranée
  Service Administratif et Financier
  Marie Schiaffino (SAF) 2004, route des Lucioles - BP 93, 06902 Sophia-Antipolis – France

- Or by e-mail with confirmation of receipt for the attention of the Inria Technical Manager indicated on the cover page and in copy to the Inria Administrative and Financial Manager (marie.schiaffino@inria.fr).

ARTICLE 13 – CONFIDENTIALITY

The Beneficiary expressly agrees to consider as confidential all creations covered by intellectual property law or know-how belonging to the Institutions has well as all the information communicated to him.

The Beneficiary hereby undertakes to authorize access to the Software exclusively for his personnel for whom such access is necessary. The said personnel shall have been informed that the Software is covered by this clause of confidentiality and shall have undertaken to use the Software in accordance with this clause.

The Beneficiary hereby undertakes to take all the necessary measures with regard to his personnel to ensure the confidentiality of the elements and information concerned by this article.

The Beneficiary hereby acknowledges that any disclosure that is not expressly authorized would adversely affect the interests of the Institutions.

The obligations stipulated in this article shall remain in force for a duration of two (2) years following the end of this Agreement.

ARTICLE 14 – APPLICABLE LAW – COMPETENT COURT - LANGUAGES

This Agreement is governed by the provisions of French law.

Any disputes resulting from the interpretation or performance of this Agreement, for which no amicable settlement has been reached between the Parties within a reasonable time period commencing on the day the dispute is notified by one of the Parties to the other Party, shall be referred to the French competent court having jurisdiction.

*****

Drawn up in 2 (two) originals version.

The Beneficiary   **Inria for the Institutions:**

                                         David Simplot

                                         Director of the Inria Sophia Antipolis-
                                         Méditerranée research centre

On: *On:*

Signature: *Signature:*

TECHNICAL APPENDIX

Software description

The software RARL2 computes a stable rational L2-approximation of specified order n to a given stable (analytic in the complement of the unit disk) matrix function. This can be the transfer function of a multivariable discrete-time stable system.
This function can be given in one of the following forms
1) a realization
2) its Fourier coefficients
3) pointwise values on the unit circle; in that case, a least square criterion is used instead of the L2 norm.
This software allows to perform model reduction (case 1 and 2) and frequency data identification (case 3). In that case, the criterion is less robust than the L2 norm and the result is very dependent on the quality of data. If it fails to be good enough, it can be necessary to first approximate the data by a large degree stable function (bounded extremal problems can be used).
An appropriate Moebius transformation allows to use the software for continuous-time systems as well.

Language: MATLAB + toolkit OPTIM + toolkit CONTROL

The main function is the function arl2.
Input arguments
1. The data to be approximate in one of the possible forms
2. An initial system (for the optimization) in state-space form. The order of the approximant will be the McMillan degree of this system.
3. Options ('rtype' can take the value "real" or "complex" according to the type of the data)
4. Optimization options (maximum number of iterations allowed, termination tolerance on the function value ...)
Output arguments: a structure containing information about the optimization
1. the best approximant (state-space form, parameters of the associated stable allpass system)
2. optimisation output arguments (number of iterations taken, value of the objective function at the solution, ...)

The number of local minima can be rather high so that the choice of an initial point for the optimization can play a crucial role.
Two methods can be used:
1) compute a best hankel approximant as initial system. This can be done using the function fc2ss from Fourier coefficients.
2) run the function RARL2 which proceeds to an iterative search from degree 1 to n : from a (local) minima at degree k, several (precise number can be specified by the user) initial systems of degree k+1 can be computed. Starting the optimization from these points does improve the error obtained at degree k.