An Interesting Insight into Using [Ruby Machine learning Library+QRNG+Entropy+Signal Processing] towards Co-Designing of Novel [Hardware/Software/Firmware] in the Context of Smart Platforms based Heterogeneous Environments to Probe Circadian Rhythms[CR] +Data.

[Exploring Testing of Pin Configurations + Firmware Using Above Mentioned Concepts]

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Abstract :

[(Ruby/mruby/Ruby Machine Learning Library/ruby-llvm compiler system/QRNG/QRNG Device/libqrng)] related Concepts involving Advanced Automated Testing of Pin Configurations & Validation of Firmware of Electronic Circuits for Smart Devices R&D in the Context of [IoT+HPC] Heterogeneous Environment/s – A Simple & Novel Suggestion to Design an Informatics Framework.Exploring Entropy towards better R&D of Signal Processing.

We present a Simple Algorithm :

{ Figure I – With Ruby+ IoT/HPC/QRNG Service & Device Configuration }

Key words : { IoT/HPC/CR/CR-Data/Ruby/Machine Learning(ML) }

[I] Inspiration & Introduction to our R&D :

http://www.sci.sdsu.edu/~salamon/MathThermoStates.pdf
http://www.cba.mit.edu/docs/papers/96.isj.ent.pdf
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.90.6200&rep=rep1&type=pdf
https://royalsocietypublishing.org/doi/full/10.1098/rspa.2012.0683

https://pubs.acs.org/doi/abs/10.1021/ed048p293
https://www.cl.cam.ac.uk/~lp15/papers/Workshop/papers/rasmussen.pdf
https://www.semanticscholar.org/...Ruby...Rasmussen/5373c07da9d00361c0a8f32e0817.
https://link.springer.com/chapter/10.1007/3-540-61511-3_80

orbit.dtu.dk/en/publications/transformational-vlsi.../export.html
https://dl.acm.org/citation.cfm?id=182269
https://www.researchgate.net/scientific-contributions/6880428_Ole_Rasmussen

https://isabelle.in.tum.de/community/Projects
https://core.ac.uk/download/pdf/13730287.pdf
https://www.academia.edu/2645599/Tool_Support_for_Logics_of_Programs
www.cs.cmu.edu/~fp/public/lfs.ps
http://vixra.org/pdf/1908.0012v1.pdf – Nirmal.

Very Important Information to Understand our Technical Presentation on Testing Smart Devices-IoT-HPC :

Information is Physical :"There are no unavoidable energy consumption requirements per step in a computer. Related analysis has provided insights into the measurement process and the communication schannel, and has prompted speculations about the nature of physical laws."

Rolf Landauer – Thomas J. Watson Research Center, Yorktown Heights, New York,USA.
[Source : https://physicstoday.scitation.org/doi/10.1063/1.881299]

https://en.wikipedia.org/wiki/Rolf_Landauer – **Information on Rolf Landauer. IBM USA.**

https://en.wikipedia.org/wiki/Charles_H._Bennett_(computer_scientist) – **Charles H Bennet IBM USA.**

https://www.sciencedirect.com/science/article/pii/S0378437198005135

https://www.cs.princeton.edu/courses/archive/fall06/cos576/papers/bennett03.pdf – *C H Bennet.*
[Notes on Landauer's principle, reversible computation, and ... **]**

https://www.scientificamerican.com/article/the-fundamental-physical-limits-of-computation – **The Fundamental Physical Limits of Computation – Scientific ...**

https://dblp.uni-trier.de/pers/b/Bennett:Charles_H= Charles H. Bennett – dblp.uni-trier.de

www.lancaster.ac.uk/users/esqn/windsor07/Lectures/Bennett1.pdf – *The Physics of Computing, Especially Quantum Computing Charles H ...*

Researchers prove Landauer was right in saying heat is dissipated when memory is erased – by Bob Yirka , Phys.org – **[Source – https://phys.org/news/2012-03-landauer-dissipated-memory-erased.html]**

https://www.nature.com/articles/nature10872 – **Experimental Verification of R.L. Principle –Info+Thermo.**

[II] Ruby Based Ruby–ML/LLVM–rb/IoT/HPC/QRNG Services based General R&D Informatics Framework :

Ruby+llvm-rb+mruby-qrnglib+ruby-Machine Learning - Design
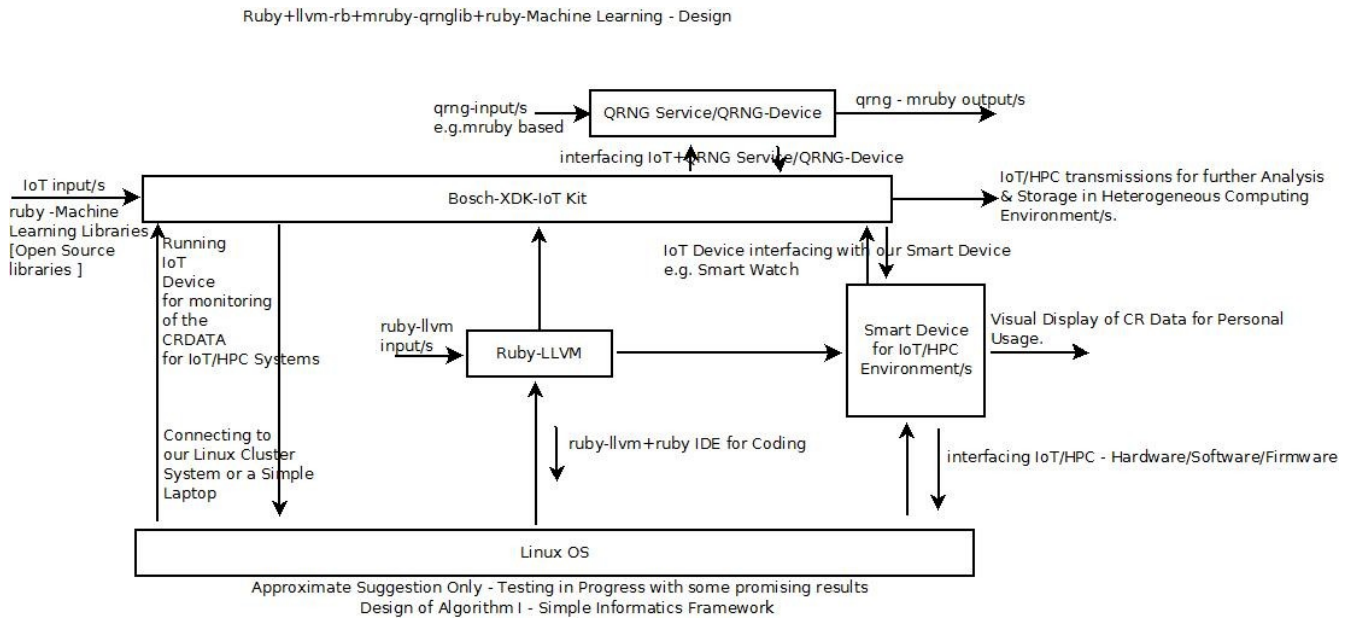
[Figure I – Ruby Machine Learning+LLVM–ruby+QRNG Informatics Platform]

Explanation of Figure I : General Bosch–XDK–IoT Platform based Smart Device Hardware/Software/Firmware/QRNG Testing Architecture–Exploring Entropy & Signal Processing for better R&D.

[II–A] LLVM gives us one of the "Best Options" to Test Embedded Systems & Related Concepts :

"Ruby–LLVM is a Ruby language binding to the LLVM compiler infrastructure library. LLVM allows users to create just–in–time (JIT) compilers, ahead–of–time (AOT) compilers for multiple architectures, code analyzers and more. LLVM bindings can also be used to speed up Ruby code by compiling and loading computationally intensive algorithms on the fly".

" Applicable to all Smart Device based input/output Pin Testing & Firmware Validation. It is very much essential in Testing Circuits/Chips/Smart Devices to develop trouble free Firmware for excellent vertical integration into Applications ".From our experience in Industry – Firmware fails for no reason once it is developed/integrated into [IoT/HPC] related Heterogeneous Computing Environment/s.Hence, this simple presentation of [Bosch–XDK IoT Kit] based "AUTOMATED PIN CONFIGURATION TESTING & FIRMWARE VALIDATION PLATFORM". However,I am not endorsing any commercial product/s here,there could be other options as well.

http://dlib.net/ – **you could also read this**. – "Dlib is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real world problems. It is used in both industry and academia in a wide range of domains including robotics, embedded devices, mobile phones, and large high performance computing environments."

https://github.com/davisking/dlib

https://anaconda.org/conda–forge/dlib

blog.dlib.net && *silverhammermba.github.io/emberb/embed*

[II-B] QRNG Services/QRNG-Devices/mruby library Information :

"Randomness is an invaluable resource in many areas of science and technology, ranging from Monte Carlo simulations to secure encryption methods. While computer generated random numbers can be used for some applications, they remain fundamentally non-random in the sense that anything generated by an algorithm is at least in principle predictable. However, quantum physics provides randomness with inherent unpredictability based on the fundamental laws of nature."

[Source : https://qrng.physik.hu-berlin.de/]

[Source : https://github.com/cremno/mruby-libqrng]

"A typical QRNG includes an entropy source for generating well-defined quantum states and a corresponding detection system. The inherent quantum randomness in the output is generally mixed with classical noises. Ideally, the extractable quantum randomness should be well quantified and be the dominant source of the randomness. "

[Source : Quantum random number generation | npj Quantum Information]
        www.nature.com/articles/npjqi201621

https://www.idquantique.com/random-number-generation/products/quantis-qrng-chip

https://www.researchgate.net/publication/228333700_Postprocessing_for_quantum_random.

https://qrange.eu/project/qrng

https://en.wikipedia.org/wiki/Entropy_(information_theory)

[III] Information Related to Mathematics & Software Used from Vixra.org :

[a] http://vixra.org/author/nirmal_tej_kumar

[b] http://vixra.org/author/n_t_kumar

[c] http://vixra.org/author/dnt_kumar

[d] http://vixra.org/author/d_n_t_kumar

[e] http://vixra.org/author/nirmal

[IV] Important Reference/s :

[1] https://royalsocietypublishing.org/doi/full/10.1098/rspa.2012.0683

[2] http://www.informationphilosopher.com/solutions/scientists/landauer/

[3] Philosophical Perceptions on Logic and Order – edited by Horne, Jeremy/ Publisher IGI Global, 2017/
     ISBN–1522524444,97815225.

[4] https://github.com/ruby-llvm/ruby-llvm

[5] https://eprint.iacr.org/2017/842.pdf

[6] https://qiskit.org/ && https://pypi.org/project/qrng/

[7] http://www.idquantique.com/random-number-generation

[8] *https://qrng.physik.hu-berlin.de/* – **useful for Ruby/mruby based applications**.

[9] https://isabelle.in.tum.de/community/Projects

[10] https://aip.scitation.org/doi/10.1063/1.523081 – **Very Important Paper for our Short Technical Note**.
{Published Online: 28 August 2008 } { Thermodynamics Journal of Mathematical Physics **17**, 1579 (1976);
https://doi.org/10.1063/1.523081 Frank J. Zeleznik – Lewis Research Center, NASA, Cleveland, Ohio 44135,USA }

[11] http://www.mizar.org/version/current/html/zf_lang.html – :: A Model of ZF Set Theory Language
:: by Grzegorz Bancerek .

[12] *https://plato.stanford.edu/entries/set-theory/ZF.html* – Zermelo-Fraenkel (ZF) set theory.

[13] https://gab41.lab41.org/using-machine-learning-to-classify-devices-on-your-network-538264c8b820

[14] *https://linkdhome.com/articles/2019/5/8/smart-devices-machine-learning-and-why-you*

[15] *https://www.leverege.com/blogpost/machine-learning-applications-in-iot*

[V] Conclusion/s With Future Perspectives :

It is useful to – Understand *Ruby* using Machine Learning & QRNG Concepts towards testing +implementing novel designs of Smart Medical Electronics in the context of IoT/HPC Related Informatics Platforms".

Ruby is an excellent choice to test many VLSI/AI/ML/DL related concepts.

Ruby interacts well with C/C++/Java/JikesRVM/IoT/HPC/LLVM in many aspects.

It is interesting to deal with Embedded Systems Design Using [Ruby ML/C++/C/mruby-QRNGServices/QRNG Devices].

Worth Noting :

"Thermodynamics is the only physical theory of universal content which, within the framework of the applicability of its basic concepts, I am convinced will never be overthrown." — Albert Einstein.

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[THE END]