Research

**Batch Blast Extractor: an automated blastx parser application**
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**Abstract**

**Motivation:** BLAST programs are very efficient in finding similarities for sequences. However for large datasets such as ESTs, manual extraction of the information from the batch BLAST output is needed. This can be time consuming, insufficient, and inaccurate. Therefore implementation of a parser application would be extremely useful in extracting information from BLAST outputs.

**Results:** We have developed a java application, Batch Blast Extractor, with a user friendly graphical interface to extract information from BLAST output. The application generates a tab delimited text file that can be easily imported into any statistical package such as Excel or SPSS for further analysis. For each BLAST hit, the program obtains and saves the essential features from the BLAST output file that would allow further analysis. The program was written in Java and therefore is OS independent. It works on both Windows and Linux OS with java 1.4 and higher. It is freely available from: [http://mcbc.usm.edu/BatchBlastExtractor/](http://mcbc.usm.edu/BatchBlastExtractor/)

**Background**

The NCBI BLAST database search tool is one of the most popular programs designed to solve single query problems. BLAST (Basic Local Alignment Search Tool) is the heuristic search algorithm employed by the programs blastp, blastn, blastx, tblastn, and tblastx. The BLAST programs were tailored for sequence similarity searching for example to identify homologs of a given query sequence [1].

The five common BLAST programs perform the following tasks: 1) blastp compares an amino acid query sequence against a protein sequence database; 2) blastn compares a nucleotide query sequence against a nucleotide sequence database; 3) blastx compares the six-frame conceptual translation products of a nucleotide query sequence (both strands) against a protein sequence database; 4) tblastn compares a protein query sequence against a nucleotide sequence database dynamically translated in all six reading frames (both strands), and 5) tblastx compares the six-frame translations of a nucleotide query sequence against the six-frame translations of a nucleotide sequence database.
### Figure 1
Screenshot of a Blastx Output.

**BLASTX 2.2.13** (Nov-27-2005)

Reference: Altschul, Stephen F., Thomas L. Madden, Alejandro A. Schäffer, Jinghua Zhang, Zheng Zhang, Webb Miller, and David J. Lipman (1997), "Gapped BLAST and PSI-BLAST: a new generation of protein database search programs", *Nucleic Acids Res.* 25:3389-3402.

Query: Contig1 (465 letters)

Database: All non-redundant GenBank CDS translations*PDB*SwissProt*PIR*PRF excluding environmental samples 3,525,883 sequences; 1,211,011,141 total letters

Searching.................................................................done

| Sequences producing significant alignments: | Score E (Bits) Value |
|--------------------------------------------|----------------------|
| sp|BF80164|MLR_LUMTE Myosin regulatory light chain, striated muscle... | 126 3e-28 |
| gb|AA61692.1|myosin regulatory light chain [Riftia pachyptila] | 120 4e-28 |
| gb|AA026851.1|SCHS000021 protein [Schistosoma japonicum] | 100 1e-20 |
| gb|ABD04174.1|myosin regulatory light chain 2-like protein [An... | 100 9e-20 |
| ref|XP_787359.1|PREDICTED: similar to Myosin regulatory light c... | 99 4e-20 |
| gb|AA914012.1|MRLC [Ctenochas simplex] | 97 3e-20 |
| ref|XP_551156.1|PREDICTED: similar to Myosin regulatory light c... | 98 9e-20 |
| emb|CAI94984.1|nonmuscle myosin II regulatory light chain [Sub... | 98 1e-19 |
| gb|AAT73618.1|calmodulin cam-205 [Bosus carota] | 45 9e-04 |
| gb|AAL70999.1|calmodulin [Lycopersicon esculentum] | 45 9e-04 |
| emb|CAI74587.1|calmodulin [Lycopersicon esculentum] | 45 9e-04 |
| gb|AAG61859.1|calmodulin mutant SYNCAM29 [synthetic construct] | 45 9e-04 |

>ap|BF80164|MLR_LUMTE Myosin regulatory light chain, striated muscle, 25 kDa isoform (LC25)
| gb|AA925173.1|myosin regulatory light chain, LC25 [lumbricus terrestris=earthworms, muscle, Peptide, 195 aa]
| prf|1190285A myosin:SUBUNIT=light chain:ISOTYPE=LC25
| Length = 195

Score = 126 bits (316), Expect = 3e-28

Identities = 45/90 (50%), Positives = 71/90 (78%)

Frame = +2

Query: 194 APVFEGBFGLFKGQDCQSFKEAMFHMIDQ-MDDIG EIQGQREYK+ + +

Sbjct: 40 APVFEGBFGLFKGQDCQSFKEAMFHMIDQ-MDDIG EIQGQREYK+ + +

Score = 125 bits (315), Expect = 4e-28

Identities = 63/91 (69%), Positives = 74/91 (81%), Gaps = 2/91 (2%)

Frame = +2

Query: 197 PKR--KFGNYVFGLFKGQDCQSFKEAMFHMIDQ-MDDIG EIQGQREYK+ + +

Sbjct: 35 PKR--KFGNYVFGLFKGQDCQSFKEAMFHMIDQ-MDDIG EIQGQREYK+ + +

Score = 371 EMKCEFCQKNLTHILFGKELGTSANNT 463

K+E P++LNTHILFGKELG+ + +

Sbjct: 35 EMKCEFCQKNLTHILFGKELGTSANNT 463

K+E P++LNTHILFGKELG+ + +

Sbjct: 95 EMKCEFCQKNLTHILFGKELGTSANNT 463

K+E P++LNTHILFGKELG+ + +

Sbjct: 95 EMKCEFCQKNLTHILFGKELGTSANNT 463
**Batch Blast Extractor**

Batch Blast Extractor is a Java application for extracting information from batch blast results.

- **Select Input file**
- **Set the number of matches:** Best Matches
- **Select Output Directory:**
- **Run**
- **List**

**Figure 2**
Screenshot of the Batch Blast Extractor Web site.

**Download - Batch Blast Extractor v1.0**
- Windows Executable ([Download](#))
- Linux and other OS - Executable Jar file ([Download](#))
  
  run the following command from the command prompt:
  ```
  java -jar BatchBlastExtractor.jar
  ```

**Requirement:**
- Java JRE 1.4 or higher

**Sample Input file:**
- Batch blast results from 50 EST sequences ([BlastXResults Text File](#))

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Mendi Pircozzi, The USM
The BLAST programs all provide information in roughly the same format. First comes (A) an introduction to the program; (B) a histogram of expectations if one was requested; (C) a series of one-line descriptions of matching database sequences; (D) the actual sequence alignments, and finally the parameters and other statistics gathered during the search. However, for genome-wide comparisons involving multiple queries (batch query), the search is a challenge. For instance, EST collections are currently produced for many species as an efficient strategy for gene identification. Analysis of the ESTs involves clustering, contig formation and annotation of thousands of fragments, interpretation of which may involve thousands of individual BLAST searches [2-5]. An automated post processing of the output (Figure 1) can simplify the analysis in such cases. The blast parser (BlastLikeSax-Parser) in BioJava [6] and BPlite from BioPerl [7] are frequently being used to parse a variety of different blast outputs, but neither are user friendly and therefore programming skills are needed to use these applications.

We developed the "Batch Blast Extractor" program (Figure 2 and 3) for use in this regard. It serves as a parser storing only the essential features of BLAST hits in a tabular form. The user can then apply a number of selection criteria to filter out hits with particular attributes. "Batch Blast Extractor" thus serves as a powerful annotation tool for large sets of query sequences.

**Results**

The application generates a tab delimited text file that can be easily imported into any statistical package such as Excel or SPSS for further analysis. For each BLAST hit, the program derives and saves the following features: Query ID, Query Length, Accession version and GI number, Alignment Length, Score, bit, E-value, Identities, Positives, Gaps, Frame, Organism, and Description.

The extracted information includes the following:

- **Query**: headers of sequences to analyze
- **Subject**: headers of sequences found in the database
- **Score**: a number representation (e.g. 550)
- **Score Text**: full text representation plus BITS (e.g. 235 bits (450))
- **Expect**: the E-Value as number (e.g. 1e-166)
- **Identities %**: a number representation (e.g. 85)
- **Identities Text**: full text representation plus characters matching (e.g. 110/130 (90%))
- **Positives %**: a number representation (e.g. 92)
The program was written in Java. It is OS independent and works on both Windows and Linux OS with java 1.4 and higher. It is freely available to noncommercial users from: http://mcbc.usm.edu/BatchBlastExtractor/ (Figure 2 and 3).

Currently the application works with blastx results. Efforts to extend functionality to other BLAST programs such as blastp and blastn are in progress.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
MP and YD initiated the project. MP designed, programmed and implemented the application and drafted the manuscript. EJP and YP directed the project. All authors read and approved the final manuscript.

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