DigiFlow: Getting Started for Newcastle

Sam Hartharn-Evans - adapted from ©Dalziel Research Partners 1999-2013
17/04/2023

Contents

1 Introduction

This document describes the installation and configuration process for DigiFlow with Newcastle Uni's setup (UniqVision UP1830CL cameras, BitFlow Framegrabber boards, Dell Precision 5820 Tower). Use of DigiFlow is covered in the User Guide.

DigiFlow is an advanced image processing system designed specifically for measuring and analysing fluid flows using a wide variety of techniques developed by Dalziel over the last eighteen years. The installed part of DigiFlow consists of DigiFlow.exe, which contains the core functionality, and a range of DLL files that handle specific menu optiuons. DigiFlow also makes use of various global start-up files stored in the same directory.

The Typographical Conventions here are:

- Analyse - Windows elements such as prompts, menu items and dialogs.

- Expt_A.dfi - File names, *etc.*

- `read_image()` - Interpreter commands and functions

2 Basic Installation

Basic installation covers the ability to process images and movies using DigiFlow, but not capture.

DigiFlow installation requires little more than unpacking the distribution files into the desired directory. This is best done from an account with administrative rights.

1. Download the latest version from Dropbox. The download file is the Bin64 folder, which should download as a .zip file.

2. Create a directory (folder) for DigiFlow (C:\Program Files (x86)\DigiFlow). It is best to avoid running DigiFlow in this directory, you should always use a directory belonging to a user rather than the system.

3. Change the permissions on this folder so that Authenticated users have Full control.
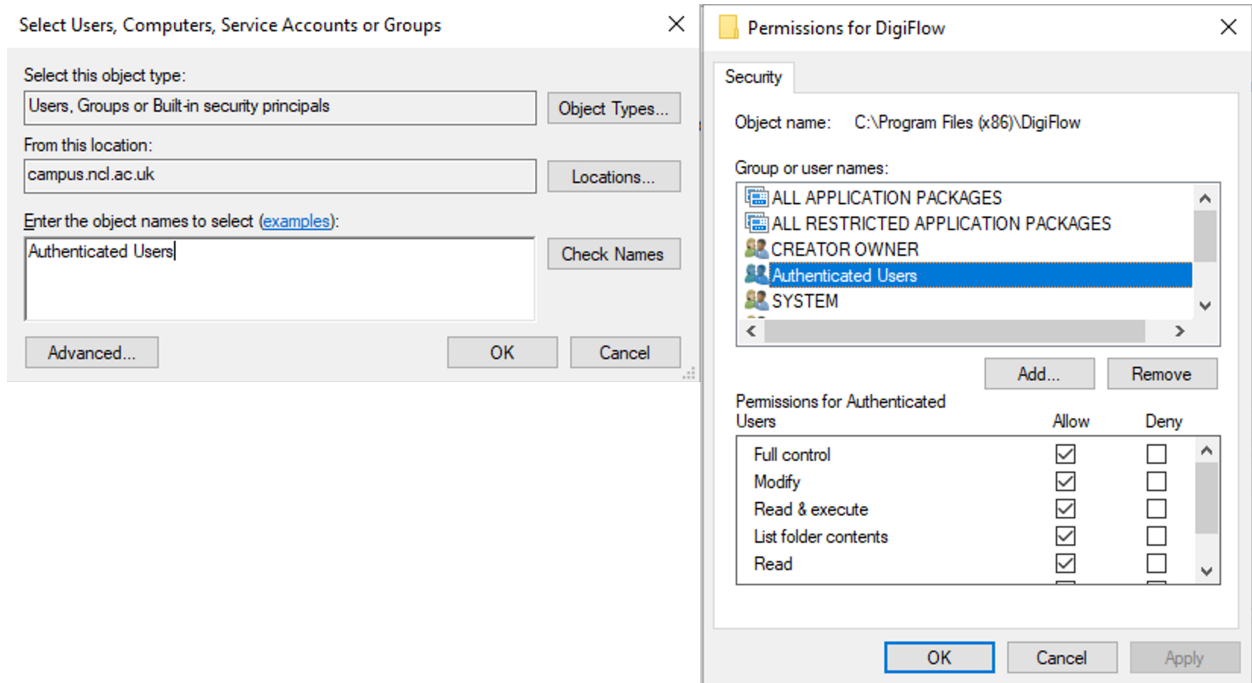
4. Copy the distribution files from the extracted directory into the DigiFlow directory.

5. If you have already been issued with a licence file for this device (DigiFlow_Licence.dfc, then copy this to the installation directory.

6. Add the folder in which DigiFlow is installed to the search path (see 6.3).

There is no need to reboot. DigiFlow can be used at this point, however, it is recommended that you first complete the configuration process described below.

3   Completing the setup

3.1   Local Settings

As different institutions have different ways of working, DigiFlow allows customisation of some features. These settings are stored in DigiFlow_LocalData.dfc. You may subsequently change these settings if you require by editing this file. Consult the User Guide for details of the contents of DigiFlow_LocalData.dfc.

1. DigiFlow has both a web-based manual and a pdf copy. The web-based version is recommended.

2. The most useful image/data format with DigiFlow is the .dfi file format. While there are many advantages to having DigiFlow automatically compress these files, their use in other applications such as Matlab is simplified if they are not compressed

3. Clicking Ok again now shows the main window of DigiFlow, but the installation process continues.
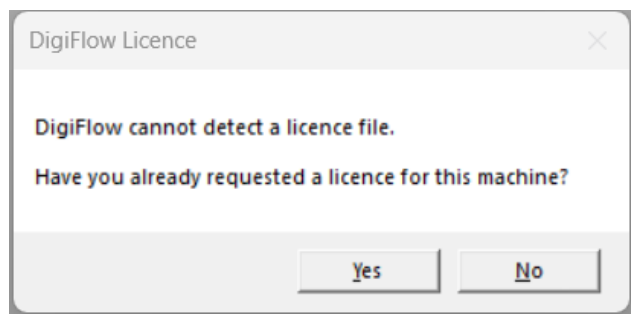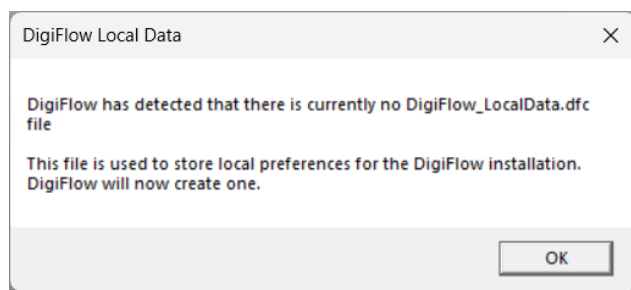
3.2 Adding a Licence

If DigiFlow is unable to find a valid licence file (DigiFlow_Licence.dfc), then you will be prompted for the information necessary for Dalziel Research Partners to generate a licence for you on opening DigiFlow.

1. If you have a licence file already, then respond Yes and copy the licence file to the directory in which DigiFlow is installed. If you do not already have a licence file, then answer No and you will be prompted for the information necessary to generate the licence file.

2. And then yes.

3. You'll be prompted for Your name?: **Magda Carr**, Your university/company? **Newcastle University**, Your Department? **Maths, Stats, Physics**, Your Country? **United Kingdom**, Your e-mail address? **magda.carr@ncl.ac.uk**, Web address for your research group? [**Leave Blank**].

4. The LicenceRequest.dat file that is created by this process should be e-mailed to Dalziel Research Partners (digiflow@dalzielresearch.com). The file will be located in the file in which DigiFlow was started, as indicated in the dialogue box.

5. The LicenceRequest.dat does not contain any security-sensitive information, or any personal information other than what you enter. Please feel free to view the contents (in a text editor) before sending.

3.3 Windows Settings

Specification of the file extension for file names within DigiFlow is mandatory in most circumstances as DigiFlow utilises this extension to determine the file type for output. However, by default, Windows XP and later hide the extensions to files of known types, a feature that can cause problems with DigiFlow. We recommend, therefore, that you turn off this feature. DigiFlow will attempt to do this for itself, but this may not work on some systems. If DigiFlow does not make all extensions visible automatically, then you may achieve this manually through the View tab of Tools: Folder Options under Windows Explorer. Simply remove the check mark from Hide extensions for known file types. Note that this will need to be done for each DigiFlow user.

4 Basic Configuration

...

5 Full Installation - With a framegrabber

5.1 Framegrabber installation

If you are installing DigiFlow in a machine equipped with a BitFlow R2, R3, R64 or R64e series framegrabber then some additional steps are required. ***These require administrative access to implement.***

The framegrabber should be installed and tested using the **BitFlow installation procedure**. You will require the BitFlow drivers for version 6.40. Later versions are currently untested and may not work - we have had issues with these previously.

1. Download BitFlow SDK 6.40 from `https://www.bitflow.com/support/request-downloads/` (possibly directly at `https://www.bitflow.com/downloads/bfsdk640.zip`.

2. Follow the instructions in the SDK Getting Started guide - paying notice to the sections *Installing the SDK*, *Initial System Tests*, and *Configure Your Board for Your Camera - Camera Link Cameras*.

The BitFlow framegrabber requires a configuration file (.cam, .rcl or .r64 for the camera being used. Configuration files for cameras known to work with DigiFlow may be found at `https://www.dalzielresearch.com/digiflow/cameras/`, but the correct one for our lab is also found here. Place this file in C:\BitFlow SDK 6.40\Config\R64.

If you have a multi-user system where most users do not have administrative access, we recommend that you change the permissions on the BitFlow software to allow all users to change the camera configuration file if and when they need to. This is achieved using the Registry Editor (regedit.exe; accessible from the command prompt) to adjust the permissions on all keys in the registry relating to 'BitFlow' by adding the 'Authenticated Users' security principle with 'Full control'. Failure to do this would mean that only users with administrative access could change the camera configuration.

Once the Framegrabber is installed, then carry out the § 2 Basic Installation steps.

If you have a multi-user system where most users do not have administrative access, we recommend that you change the permissions on the BitFlow software to allow all users to change the camera configuration file if and when they need to. This is achieved using the Registry Editor (regedit.exe; accessible from the command prompt) to adjust the permissions on all keys in the registry relating to 'BitFlow' by adding the 'Authenticated Users' security principle with 'Full control'. Failure to do this would mean that only users with administrative access could change the camera configuration.

5.2 Video Capture Configuration

It is strongly recommended that video capture is to a disk other than that containing the operating system in order to obtain adequate performance. The necessary disk system bandwidth may be in excess of 240MB/s in some cases (e.g. with a Dalsa 4M60 camera), thus requiring a Mode 0 RAID array, or using Windows to 'stripe' across multiple disks. However, for most cameras 40MB/s is sufficient and this may be achieved via a fast IDE or SATA disk (but not the one the operating system is on!).

The capture process in DigiFlow can be configured in two ways. Either you can directly specify the capture file and location each time (risking the user specifying a disk system with insufficient bandwidth), or setting up DigiFlow to capture to a fixed location and require the user to 'review' (and possibly edit) the sequence in order to copy it into their own directory space. For multi-user systems, this second is generally preferred as it allows users to utilise the capture facility like a video recorder while preventing retention of unwanted video footage.

The default configuration takes the second option, and assumes that the capture location is V:\Cache\CaptureVideo.dfr We recommend that you configure your system so that this directory exists (either by appropriate naming

of the capture disk, or by setting up a share to an appropriate point and then connecting to it). This directory must not be compressed and must have full access for all DigiFlow users. Once you have created this directory, you should (within DigiFlow) run File: Live Video: Setup (see DigiFlow Manual § 5.1.5.3 for further details) to create the initial V:/Cache/CaptureVideo.dfm. **It is strongly recommended that you do this before writing any other data to the capture disk**. Details on how to change the name or location of the cache file may be found in the main manual §13.2.

It is important that the space DigiFlow reserves in this file remains as a single contiguous block on the disk drive. If it becomes fragmented for any reason then, due to the very high data transfer rates required, DigiFlow may not be able to write to the disk as fast as data becomes available from the camera and so timing errors may result.

Once created, V:/Cache/CaptureVideo.dfm will be flagged as Read only by the operating system (although DigiFlow will still be able to write to it). The file will not shrink if a smaller sequence is captured, but may grow if one larger than that specified during File: Live Video: Setup is requested (note that there is a risk of fragmentation if this occurs). It is important, therefore, that you go through the review process outlined in the main manual §5.1.5.2, rather than simply copying this file, as in general only a part of the file will contain valid data.

Consult the manual §13.2 on DigiFlow_LocalData.dfc should you wish to change the name or location of V:/Cache/CaptureVideo.dfm.

6   Advanced Configuration

6.1   Making the camera capture work

On the Dell workstations, there was an issue with write speeds during capture, thought to be due to the Avago RAID Controller card. DigiFlow has an in-built buffer of 8 bits to allow for very small delays. To test if this fix is needed (and fix if it is):

- Run camera capture for around 300 seconds. After this has happened, if the error has occurred it will notify you of this, and on the second dialogue inform you that there has been a capture error of # frames.

- Open DigiFlow_Cameras.dfc within the DigiFlow installation folder in a text editor. Locate the line `CameraInfo. UniqVision_UP1830CL_8bit.nTotalBuffers := 8; # Total number of buffers available`, and change to `:= 256;`.

It is also important that the V: (video capture drive) and C: (the Windows OS drive, also containing DigiFlow) drives are physically separate drives.

6.2   Adding Colormaps

To add the redwhiteblue colormap to DigiFlow (useful for viewing piv/vorticity in a divergent and perpetually uniform colormap), edit DigiFlow_Configuration.dfc and add the following text after the final `add_color_scheme("...");`, and before the `destroy_variable("r");` lines:

```
r := [ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.0156 0.0313 0.0469 0.0625 0.0781 0.0938 0.109 0.125
    0.141 0.156 0.172 0.188 0.203 0.219 0.234 0.25 0.266 0.281 0.297 0.313 0.328 0.344 0.359 0.375
    0.391 0.406 0.422 0.438 0.453 0.469 0.484 0.5 0.516 0.531 0.547 0.563 0.578 0.594 0.609 0.625
    0.641 0.656 0.672 0.688 0.703 0.719 0.734 0.75 0.766 0.781 0.797 0.813 0.828 0.844 0.859 0.875
    0.891 0.906 0.922 0.938 0.953 0.969 0.984 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
     1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0.996 0.988 0.98
    0.972 0.965 0.957 0.949 0.941 0.933 0.925 0.917 0.909 0.902 0.894 0.886 0.878 0.87 0.862 0.854
    0.846 0.839 0.831 0.823 0.815 0.807 0.799 0.791 0.783 0.776 0.768 0.76 0.752 0.744 0.736 0.728
    0.72 0.713 0.705 0.697 0.689 0.681 0.673 0.665 0.657 0.65 0.642 0.634 0.626 0.618 0.61 0.602
    0.594 0.587 0.579 0.571 0.563 0.555 0.547 0.539 0.531 0.524 0.516 0.508 0.5];
```

```
g := [ 0 0.00781 0.0156 0.0234 0.0313 0.0391 0.0469 0.0547 0.0625 0.0703 0.0781 0.0859 0.0938
    0.102 0.109 0.117 0.125 0.133 0.141 0.148 0.156 0.164 0.172 0.18 0.188 0.195 0.203 0.211
    0.219 0.227 0.234 0.242 0.25 0.258 0.266 0.273 0.281 0.289 0.297 0.305 0.313 0.32 0.328
    0.336 0.344 0.352 0.359 0.367 0.375 0.383 0.391 0.398 0.406 0.414 0.422 0.43 0.438 0.445
    0.453 0.461 0.469 0.477 0.484 0.492 0.5 0.508 0.516 0.523 0.531 0.539 0.547 0.555 0.563
    0.57 0.578 0.586 0.594 0.602 0.609 0.617 0.625 0.633 0.641 0.648 0.656 0.664 0.672 0.68
    0.688 0.695 0.703 0.711 0.719 0.727 0.734 0.742 0.75 0.758 0.766 0.773 0.781 0.789 0.797
    0.805 0.813 0.82 0.828 0.836 0.844 0.852 0.859 0.867 0.875 0.883 0.891 0.898 0.906 0.914
    0.922 0.93 0.938 0.945 0.953 0.961 0.969 0.977 0.984 0.992 1 1 0.984 0.969 0.953 0.937
    0.921 0.906 0.89 0.874 0.858 0.843 0.827 0.811 0.795 0.78 0.764 0.748 0.732 0.717 0.701
    0.685 0.669 0.654 0.638 0.622 0.606 0.591 0.575 0.559 0.543 0.528 0.512 0.496 0.48 0.465
    0.449 0.433 0.417 0.402 0.386 0.37 0.354 0.339 0.323 0.307 0.291 0.276 0.26 0.244 0.228
    0.213 0.197 0.181 0.165 0.15 0.134 0.118 0.102 0.0866 0.0709 0.0551 0.0394 0.0236 0.00787 0
     0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];

b := [ 0.5 0.508 0.516 0.523 0.531 0.539 0.547 0.555 0.563 0.57 0.578 0.586 0.594 0.602 0.609
    0.617 0.625 0.633 0.641 0.648 0.656 0.664 0.672 0.68 0.688 0.695 0.703 0.711 0.719 0.727
    0.734 0.742 0.75 0.758 0.766 0.773 0.781 0.789 0.797 0.805 0.813 0.82 0.828 0.836 0.844
    0.852 0.859 0.867 0.875 0.883 0.891 0.898 0.906 0.914 0.922 0.93 0.938 0.945 0.953 0.961
    0.969 0.977 0.984 0.992 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
     1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0.984 0.969 0.953 0.937
    0.921 0.906 0.89 0.874 0.858 0.843 0.827 0.811 0.795 0.78 0.764 0.748 0.732 0.717 0.701
    0.685 0.669 0.654 0.638 0.622 0.606 0.591 0.575 0.559 0.543 0.528 0.512 0.496 0.48 0.465
    0.449 0.433 0.417 0.402 0.386 0.37 0.354 0.339 0.323 0.307 0.291 0.276 0.26 0.244 0.228
    0.213 0.197 0.181 0.165 0.15 0.134 0.118 0.102 0.0866 0.0709 0.0551 0.0394 0.0236 0.00787 0
     0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0];
add_colour_scheme("redwhiteblue", r, g, b);
```

6.3 Setting the Path

- Open the Edit the system environment variables panel by searching "Environment" in the Windows start bar.
- Click the Environment Variables to open Environment Variables, and Edit the System Variables: Path

Environment Variables

User variables for samha

Variable	Value
HOME	C:\Users\samha
OneDrive	C:\Users\samha\OneDrive - Newcastle University
OneDriveCommercial	C:\Users\samha\OneDrive - Newcastle University
OneDriveConsumer	C:\Users\samha\OneDrive
Path	C:\Users\samha\anaconda3;C:\Users\samha\anaconda3\Librar...
TEMP	C:\Users\samha\AppData\Local\Temp
TMP	C:\Users\samha\AppData\Local\Temp

New...   Edit...   Delete

System variables

Variable	Value
MIC_LD_LIBRARY_PATH	%INTEL_DEV_REDIST%compiler\lib\mic
NUMBER_OF_PROCESSORS	12
OS	Windows_NT
Path	%INTEL_DEV_REDIST%redist\intel64\compiler;C:\Windows\sy...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTU...	AMD64
PROCESSOR_IDENTIFIER	Intel64 Family 6 Model 165 Stepping 2, GenuineIntel

New...   Edit...   Delete

OK   Cancel

Edit environment variable

%INTEL_DEV_REDIST%redist\intel64\compiler
C:\Windows\system32
C:\Windows
C:\Windows\System32\Wbem
C:\Windows\System32\WindowsPowerShell\v1.0\
C:\Windows\System32\OpenSSH\
C:\Program Files (x86)\NVIDIA Corporation\PhysX\Common
C:\Program Files\NVIDIA Corporation\NVIDIA NvDLISR
C:\Program Files\MATLAB\R2022a\bin
%SystemRoot%\system32
%SystemRoot%
%SystemRoot%\System32\Wbem
%SYSTEMROOT%\System32\WindowsPowerShell\v1.0\
%SYSTEMROOT%\System32\OpenSSH\
C:\Program Files\dotnet\
C:\Program Files\Git\cmd
C:\Program Files (x86)\DigiFlow\

New
Edit
Browse...
Delete

Move Up
Move Down

Edit text...

OK   Cancel